Emulex Drivers for Windows

FC and FCoE version 2.41.002

NIC version 2.103.389.0

iSCSI version 2.103.386.0

User Manual

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One Company.
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Emulex, 3333 Susan Street
Costa Mesa, CA 92626

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Installation

Introduction

AutoPilot Installer® for Emulex® Storport Miniport and Network Driver Interface Specification (NDIS) Miniport drivers provides installation options that include simple installations with a few mouse clicks to unattended installations that use predefined script files and text-only installations. AutoPilot Installer is included with Emulex drivers and utilities in Windows executable files (kit installers) that you can download from the Emulex website.

There are three types of driver kits. Each driver kit contains x86, x64 and IA64 drivers and installs the correct files on a per-adapter basis.

- FC and FCoE Driver package (elxdrvr-fc-fcoe-<version>.exe)
- iSCSI Driver package (elxdrvr-iscsi-<version>.exe)
- NIC Driver package (elxdrvr-nic-<version>.exe)

Run one of the driver kit installers to extract the software needed for the driver installation.

You can install a driver by any of the following methods:

Note: These installation methods are not mutually exclusive.

Hardware-first installation. At least one Emulex adapter must be installed before you install the Emulex drivers and utilities.

Software-first installation. You can install drivers and utilities using AutoPilot Installer prior to the installation of any adapters. You do not need to specify the adapter models to be installed later. The appropriate drivers and utilities automatically load when you install the adapters.

Text-Only installation. Text-based installation mode is used automatically when AutoPilot Installer is run on a Server Core system.

Network installation. You can place the driver kit installers on a shared network drive and install them across your local area network (LAN). Network-based installation is often used in conjunction with unattended installation and scripting. This allows you to configure and install the same driver version on all the hosts in a SAN.

Unattended installation. You can run the driver kit installers and AutoPilot Installer with no user interaction from a command line or script. Unattended installation works for both hardware-first and software-first installations and all driver kits. An unattended installation operates in silent mode (sometimes referred to as quiet mode) and creates an extensive report file with installation status.

Important Considerations

New in This Release

- This release features three types of driver installer kits (FC+ FCoE, iSCSI and NIC). Each driver kit contains x86, x64 and IA64 drivers and installs the correct files on a per-system basis.
- There are two types of utility kits: OneCommand Manager™ enterprise application includes a Graphical User Interface (GUI) and a Command Line Interface (CLI) and OneCommand Manager core application includes the CLI, but not the OneCommand application GUI. See the *OneCommand Manager application version 5.1 User Manual* for more information.

Minimum Software Requirements

AutoPilot Installer will not allow you to install the driver if the minimum Windows service pack or Microsoft Storport driver update is not installed.

Changing Driver Types

If you currently use a SCSIport Miniport or FC Port driver, the driver will be replaced when you install the Emulex Storport Miniport FC driver. The FC driver will be installed for all adapters on the server. You will also lose your customized driver parameters, persistent bindings, LUN masking and LUN mapping. The default parameters set with AutoPilot Installer are usually the best options. However, you may want to note your current settings before you install the Emulex FC driver. After the installation, you can then update your customized driver parameters.

Note: This update process can leave files associated with old driver kits on your system. After running AutoPilot Installer and restarting your system, you may be required to uninstall old driver or utility program entries. Follow the procedures in “Uninstalling the AutoPilot Installer” on page 24. Ensure you delete only previous driver versions.

Storport Miniport Driver Information

FC and FCoE Driver

Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86, x64 or Itanium[1] server.
  - Windows Server 2008 running on an x86, x64 or Itanium[1] 64-bit server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 or Itanium[1] 64-bit server.
  - Windows PE 2.x or 3.x[2].
- Minimum 512 MB memory.

Note: Check the Emulex website for required updates to the Windows operating system or the Emulex drivers.

Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex website. For compatible firmware versions, see the Downloads page for the specific adapter.

iSCSI Driver

Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86 or x64 server.
  - Windows Server 2008 running on an x86 or x64 server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 server.
  - Windows PE 2.x or 3.x[2].
- Minimum 512 MB memory.

Note: Check the Emulex website for required updates to the Windows operating system or the Emulex drivers.

Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex website. For compatible firmware versions, see the Downloads page for the specific adapter.

1. Itanium support is for FC driver only.
2. AutoPilot Installer is not supported for use with Windows PE. Please Consult the Windows Automated Installation Kit (WAIK) documentation on how to include drivers with your Windows PE images.

NDIS Miniport Ethernet (NIC) Driver

Note: Although TOE is supported, it is only enabled for certain adapters on Windows Server 2008 R2.

Prerequisites

- One of the following operating systems must be installed:
  - Windows Server 2003 SP2 running on an x86 or x64 server.
  - Windows Server 2008 running on an x86 or x64 server.
  - Server Core installation option of Windows Server 2008 running on an x86 or x64 server.
  - Windows Server 2008 R2 running on an x64 server.
  - Windows PE 2.x or 3.x[2].
- Minimum 512 MB memory.

Note: Check the Emulex website for required updates to the Windows operating system or the Microsoft Storport driver.

Compatibility

For a list of adapters that are compatible with this driver, see the driver's Downloads page on the Emulex website. For compatible firmware versions, see the Downloads page for the specific adapter.

Driver Kit Installer Overview

The driver kit installer is an executable file that self-extracts and copies the following software onto your system:

- Protocol drivers - Manage communication and data transfer between applications and I/O devices, using Emulex adapters as agents. There are three separate drivers for Emulex adapters: FC and FCoE, iSCSI, and Ethernet.
- ElxPlus driver - Supports the OneCommand Manager application, persistent binding and LUN mapping and masking.

If you are creating Windows PE disk images and/or performing boot from SAN installation, you must select the **Unpack All Drivers** option instead of running AutoPilot Installer. See step 2 of Installing the Driver Kit in the following procedure.

After the driver kit is installed, you have two options:

- Automatically run AutoPilot Installer immediately. This is the default option. See Option 1 on page 6 for more information.
- Explicitly run AutoPilot Installer later on your system. See Option 2 on page 6 for more information.

Installing the Driver Kit

To install the driver kit:

1. Download the driver kit installer from the Emulex website to your system.

   Note: The name of the driver kit installer depends on the current version identifier.

2. If you plan to create Windows PE disk images and/or perform boot from SAN installations, unpack all drivers. On the driver kit installer Welcome page, select the **Unpack all drivers** checkbox. Checking this checkbox unpacks all the drivers into the 'My Documents' directory.
3. Choose one of two options:
   - For an automatic interactive installation, see "Option 1: Automatically Run AutoPilot Installer" on page 6.
   - For control of all interactive installation settings, see "Option 2: Run AutoPilot Installer Separately" on page 6.
- For an unattended installation with AutoPilot Installer, see "Performing an Unattended Driver Installation" on page 9.

Text-Only Driver Installation

Text-based installation mode is used automatically when the driver kit installer runs on a server with the Server Core installation option of Windows Server. During text-based installations, AutoPilot Installer uses a command prompt window. The driver kit installer notifies you when the driver is installed and also gives you a chance to stop the installation.

Whether it is launched from the command line or started programmatically, Windows always starts AutoPilot Installer as a separate stand-alone task. This means that AutoPilot Installer has its own command prompt window and cannot access others.

AutoPilot Installer Overview

AutoPilot Installer runs after the driver kit and the OneCommand Manager application are installed. It can be run by:

- Continuing the installation process after the driver kit installation completes.
- Interactive installation at a later time.
- Unattended installation.

AutoPilot Installer Features

- Command line functionality - Initiates an installation from a command prompt or script. Configuration settings can be specified in the command line.
- Compatibility - Verifies that the driver to be installed is compatible with the operating system and platform.
- Driver updates - Installs and updates drivers.
- Multiple adapter installation capability - Installs drivers on multiple adapters, alleviating the need to manually install the same driver on all adapters in the system.
- Driver diagnostics - Determines whether the driver is operating properly.
- Silent installation mode - Suppresses all screen output (necessary for unattended installation).

Starting Installers from a Command Prompt or Script

When a driver kit installer or AutoPilot Installer is run from a command prompt or command script (batch file), the Windows command processor does not wait for the installer to run to completion. Thus you cannot check the exit code of the installer before the next command is executed. Emulex recommends that command line invocation always use the “start” command with the “/wait” option. This causes the command processor to wait for the installer to complete before it continues.

Running a Software Installation Interactively

There are two options when performing an installation interactively. These options assume you have already downloaded the driver kit installer from the Emulex website.

Option 1: Automatically Run AutoPilot Installer

Use this option unless you have specific configuration needs. This option allows you to complete a driver kit installation and AutoPilot installation with a few simple mouse clicks.

1. Double-click the driver kit installer or run it from a command line. See “AutoPilot Installer Command Line Parameters” on page 10 for information on the command line options. The command line parameter, APargs, lets you specify arguments that will automatically be passed to the AutoPilot Installer command. A Welcome page is displayed with driver kit version information and Emulex contact information.
2. Click **Next** to proceed to the Installation Options page.

   For each installation option, the default installation location for that option is displayed. Browse to a different location, if desired.
3. Click **Install** to continue the installation.

   The Progress dialog box is displayed. After all tasks complete, a Finish page is displayed. The Start AutoPilot Installer box is automatically selected.
4. Click **Finish**. AutoPilot Installer is run automatically.

Option 2: Run AutoPilot Installer Separately

This option is recommended to:

- Change installation settings for a limited number of systems.
- Familiarize yourself with AutoPilot Installer configuration options.

To access these features, run AutoPilot Installer after driver kit installation is complete. This allows you to change the configuration options supplied to AutoPilot Installer (see below).

1. Perform steps 1 through 3 for Option 1.
2. Clear the **Run AutoPilot Installer** check box on the Finish page.
3. Click **Finish**. The driver kit installer exits.

After the driver kit installation is complete, change the configuration in one of the following two ways:

- Change the configuration file. See “Software Configuration Parameters” on page 12 for details.
- Supply parameters on the command line. See “The syntax of a parameter setting is” on page 11 for details.

Once you have finished this step, you can run AutoPilot Installer at a later time, using either of the following methods: (If you are supplying options via the command line, you must use the second option.)

- Select **Programs>Emulex>AutoPilot Installer** in the Start menu.

- Run AutoPilot Installer from a command line. Type:

  ```
  C:\Program Files\Emulex\AutoPilot Installer\APInstall.exe
  ```

Note: The location of APInstaller.exe may differ on your system, depending on your system's Program Files location. You may also specify a different location when you install the driver package.

Hardware-First Installation or Driver Update

The driver kit installer must be downloaded from the Emulex website and installed.

Note: Updating the NIC protocol driver may temporarily disrupt operation of any NIC teams configured on the system.

Note: To update the Emulex protocol drivers, begin the following procedure at step 2.

To perform a hardware-first installation:

1. Install a new Emulex adapter and power-on the system. If the Windows Found New Hardware wizard is displayed, click **Cancel** to exit. AutoPilot Installer performs this function.

   Note: If there are multiple adapters in the system, the Windows Found New Hardware wizard appears multiple times. Click **Cancel** to exit the wizard each time it appears.

2. Run AutoPilot Installer using any of the options listed in the “Running a Software Installation Interactively” on page 6.
3. When the AutoPilot Installer Welcome page appears, select an adapter in the list and click **Next**. Installation continues. Consider the following:
   - If you are replacing a SCSIport Miniport or FC Port driver, an Available Drivers list will be displayed. Click **OK** on this window.
   - If you are updating the driver, the existing port settings will be used, unless otherwise specified in the configuration file. These settings will be pre-selected but can be changed. Set or change settings, then click **Next**.
   - If you are initially installing a vendor-specific version of the Emulex driver installation program, a Driver Configuration page may be displayed. This page includes one or more windows with questions that you must answer before continuing the installation process. In this case, answer each question and click **Next** on each window to continue.
4. Click **Next**. Installation automatically continues to completion. A dialog box will be displayed if Windows requires a reboot. View the progress of the installation. Once the installation is successful, a Finish page appears.
5. View or print a report, if desired.
   - View Installation Report - The installation report is a text file with current Emulex adapter inventory, configuration information and task results.
   - Print Installation Report - The Windows print dialog is displayed to select options for printing the installation report.
6. Click **Finish** to exit AutoPilot Installer. If the system needs to be rebooted, you are prompted to do so as indicated in step 4; you must reboot before using the drivers or utilities.

Software-First Installation

The driver kit installer must be downloaded from the Emulex website and installed.

To perform a software-first installation:

1. Run AutoPilot Installer using any of the options listed in the “Running a Software Installation Interactively” on page 6. The following message appears:

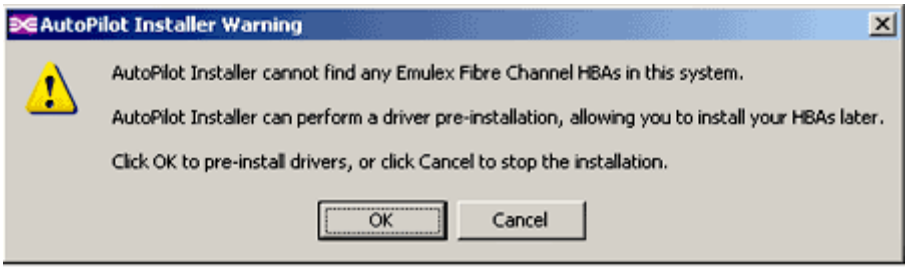
AutoPilot Installer Warning
AutoPilot Installer cannot find any Emulex Fibre Channel HBAs in this system.
AutoPilot Installer can perform a driver pre-installation, allowing you to install your HBAs later.
Click OK to pre-install drivers, or click Cancel to stop the installation.
OK
Cancel

Figure 1: AutoPilot Installer Warning (Software-First Installation)

2. Click **OK**. A Welcome page appears.
3. Click **Next**. Installation automatically progresses.

   View the progress of the installation. Once the installation completes successfully, a Finish Page appears.
4. View or print a report, if desired.
   - View Installation Report - The installation report is a text file with current Emulex adapter inventory, configuration information and task results.
   - Print Installation Report - The Windows print dialog is displayed to select options for printing the installation report.
5. Click **Finish** to exit AutoPilot Installer.

Diagnostics

Once the AutoPilot Installer finishes, the finish screen is displayed.

If the installation fails, the Diagnostics window shows that the adapter failed. If the adapter fails:

1. Select the adapter to view the reason why the adapter failed. The reason and suggested corrective action are displayed.
2. Perform the suggested corrective action and run AutoPilot Installer again.

Note: AutoPilot Installer can be run again from the Start menu (**Programs>Emulex>AutoPilot Installer**) or APInstall.exe can be run from a command prompt.

Performing an Unattended Driver Installation

An unattended driver installation, sometimes referred to as a quiet or silent installation, requires no user input. This is useful for performing an installation remotely from a command script, or when you want to make sure a custom configuration will not be changed by a user during installation.There are two ways to perform an unattended installation. These correspond to the options for running the software installation interactively.

Option 1: Install the driver silently

Run the driver kit installer from a command prompt or script. Specify the “/q” (quiet) command line option. For example:

```
elxdrv-fc-fcoe<version>.exe /q2
```

Note: The name of the driver kit installer depends on the current version identifier. For other command line options, see “AutoPilot Installer Command Line Parameters” on page 10.

Option 2: Run the driver kit installer separately

- Run the driver kit installer, but defer running AutoPilot Installer. Then choose one of the following options:
  - Run the AutoPilot Installer from a command prompt or script with the silent option:
    `APInstall.exe /silent`
  - Edit the AutoPilot Installer configuration file before running the AutoPilot Installer. The configuration file is typically located in:
    `C:\Program Files\Emulex\AutoPilot Installer\APInstall.cfg`

    Uncomment the line that sets SilentInstallEnable to “True”. There are other settings in the same section of the configuration file related to unattended installations that you may also want to edit. See “Software Configuration Parameters” on page 12 for more information. After editing the file, you can run the AutoPilot Installer from the Start menu, a command prompt or a script.

When in unattended installation mode, AutoPilot Installer does the following:

1. Reads the configuration file.
2. Reads any options that may be specified on the command line, overriding the configuration file settings as appropriate.
3. Opens the installation report file.
4. Validates the operating system.
5. Discovers adapters and records the adapter inventory in the report file.
6. Verifies mandatory configuration file parameters.
7. Searches for drivers to be installed based on the LocalDriverLocation setting in the configuration file.
8. If appropriate, verifies that the selected driver is a different type than the currently installed driver, or more recent version of the currently installed driver.
9. Copies the driver parameters from the configuration file into the registry for the driver's coinstaller (FC and FCoE drivers only).
10. Installs/updates the driver.
11. Rediscovers adapters and records the updated adapter inventory in the report file.
12. Records the final results and closes the report file.

AutoPilot Installer Command Line Parameters

You can pass command line parameters to the AutoPilot Installer, yet still have it run automatically by the driver kit, if you run the driver kit installer from a command prompt or script.

If you specify the “/q” switch with the driver kit installer command, the driver kit installer will run in unattended mode and it will automatically invoke the APInstall.exe with its “/silent” switch. See the “Performing an Unattended Driver Installation” on page 9 for more information.

If you specify a value for the “APargs” driver kit parameter, this value will be appended to the APInstall.exe command line. See “The syntax of a parameter setting is” on page 11 for more information on the AutoPilot Installer settings that may be specified in the APargs value.

For example, assume the driver kit installer file you downloaded from the Emulex website is named elxocm-windows-5.0.2.14-1.exe. If you execute this installer file as:

```
elxdrv-fc-fcoe<version>.exe /q APargs=SilentRebootEnable=True
```

then after installing the AutoPilot Installer, the driver kit will automatically execute it as:

```
APInstall.exe /silent SilentRebootEnable=True
```

To specify more than one parameter, separate the settings by one or more spaces and put quotes around the entire APargs expression. For example, the command line (all on one line)

```
elxdrv-fc-fcoe<version>.exe "APargs=SilentRebootEnable=True
localDriverLocation = "d:\drivers\new\Storport"
```

results in the AutoPilot Installer being run as:

```
APInstall.exe SilentRebootEnable=True localDriverLocation =
"d:\drivers\new\Storport"
```

Parameter values that contain spaces, such as path names, must be enclosed in quotes. To add such a setting to APargs, you must insert backslashes before the quotes around the value, and then add quotes around the entire APargs expression. For example, the command line (all on one line)

```
elxdrv-fc-fcoe<version>.exe "APargs=ReportLocation=\"C:\Documents and
Settings\Administrator\My Documents\reports\""
```

results in AutoPilot Installer being run as:

```
APInstall.exe ReportLocation="C:\Documents and Settings\Administrator\My
Documents\reports"
```

If you have many parameters to pass to the AutoPilot Installer, or if you want to do so repeatedly, then it may be less error prone to run the utility kit installer interactively, delay AutoPilot Installer execution, and then run the AutoPilot Installer command yourself. The procedure for doing so is described in “Option 2: Run AutoPilot Installer Separately” on page 6 and “Performing an Unattended Driver Installation” on page 9.

You can specify a non-default directory for the driver kit by specifying an 'installation folder' on the command line. For example:

```
elxdrv-fc-fcoe<version>.exe install:"C:\Emulex"
```

This option can be used in conjunction with the 'APArgs' directive.

AutoPilot Installer Command Line Parameters

The syntax used to run AutoPilot Installer silently from a command line or script is:

```
APInstall [/silent] [parameter setting][parameter setting...]
```

The “silent” switch and parameter settings can occur in any order. One or more spaces must separate the switch and each parameter setting.

The syntax of a parameter setting is

```
parameter_name =["]value["]
```

Double quotes are required only around values that contain spaces. Spaces may separate parameters, equal signs and values. Parameter names and values are not case-sensitive.

The APInstall command may contain the settings listed below. Each setting, except ConfigFileLocation, may also be specified in the AutoPilot Configuration file. For descriptions of each parameter, see “Software Configuration Parameters” on page 12.

Settings specified in the APInstall command override those specified in the configuration file.

```
ConfigFileLocation = path-specifier
NoSoftwareFirstInstalls = { TRUE | FALSE }
SilentRebootEnable = { TRUE | FALSE }
ForceDriverUpdate = { TRUE | FALSE }
ForceDriverTypeChange = { TRUE | FALSE }
SkipDriverInstall = { TRUE | FALSE }
InstallWithoutQFE = { TRUE | FALSE }
ForceRegUpdate = { TRUE | FALSE }
LocalDriverLocation = path-specifier
ReportLocation = path-specifier
```

Path Specifiers

Paths may be specified as

- an explicit path:

  ```
  ReportLocation="C:\Program Files\Emulex\AutoPilot Installer\Reports"
  ```

- a relative path:

  ```
  LocalDriverLocation="Drivers\Storport Miniport\"
  ```

  (assuming installation into “C:\Program Files\Emulex\AutoPilot Installer\”, this path would logically become “C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport Miniport\”)

- with the %ProgramFiles% environment variable:

  ```
  LocalDriverLocation = "%ProgramFiles%\Emulex\AutoPilot Installer\Driver"
  ```

Configuration File Location

The optional setting ConfigFileLocation contains the path to the configuration file that should be used. If this parameter is not specified, AutoPilot Installer will use the file named APInstall.cfg in the same folder as APInstall.exe.

The format is the same as that of the other path settings.

Example

```
APInstall /silent SkipDriverInstall=True
configFileLocation=MyConfiguration.cfg
```

Software Configuration Parameters

DiagEnable (Running Diagnostics)

Note: The DiagEnable parameter cannot be specified on the command line.

Default: True

By default, AutoPilot Installer will run its diagnostics after all driver installation tasks have been completed. To disable this function, set this parameter to false.

ForceDriverTypeChange (Forcing a Driver Type Change)

Default: False

When installing a driver, set this parameter to true to cause silent mode installations to update/install the Storport Miniport driver on each adapter in the system, without regard for the currently installed driver type (replacing any installation of the SCSIport Miniport or FC Port driver).

ForceDriverUpdate (Forcing a Driver Version Update)

Default: False

By default, if the same version of the driver is already installed, an unattended installation will proceed with installing only the utilities.To force a driver update even if the same version of the driver is installed, set this parameter to true.

Note: ForceDriverUpdate applies to unattended installations only; in interactive installations this parameter is ignored. Instead you are asked if the driver should be updated.

ForceRegUpdate (Forcing Updates of an Existing Driver Parameter Value)

Default: False

The ForceRegUpdate driver parameter setting determines if existing driver parameters are retained or changed when you update the driver. By default, all existing driver parameter settings are retained. The ForceRegUpdate parameter does not affect any existing persistent bindings. To set up an installation to remove the existing driver parameters from the registry and replace them with parameters specified in the AutoPilot Configuration file, set this parameter to true.

Note: You can also use this setting for attended installations with the AutoPilot Installer wizard if you modify the AutoPilot Configuration file in an AutoPilot Installer Kit.

LocalDriverLocation (Specifying Location to Search for Drivers)

Default: Drivers (The default “Drivers” folder is located in the same folder as AutoPilot Installer.)

You can specify a local location that is to be searched for drivers during unattended installations. The location may be a local hard drive or a network share. Removable media are not searched. Example:
`LocalDriverLocation = "d:\drivers\new\Storport"`

Note: On x64 and 32-bit systems, the path specified by 'LocalDriverLocation' must contain at least one instance of an FC, FCoE, iSCSI, and NIC driver. AutoPilot Installer will automatically select the most recent revisions that it finds.

For IA64 systems, only FC and FCoE drivers are supported, so no iSCSI or NIC drivers are included for installation.

NoSoftwareFirstInstalls (Prohibiting Software First Installations)

Default: False

When this parameter is set to true, AutoPilot Installer prevents unattended installations from performing software-first installations. This way, you can execute an automated installation on multiple machines in your network, but only machines with Emulex adapters will actually have Emulex drivers updated or installed.

If this parameter is omitted from the configuration file or explicitly set to true, the page is not displayed. AutoPilot Installer will use configuration file parameters to determine the appropriate management mode.

ReportLocation (Setting Up an Installation Report Title and Location)

The automatically generated file name for reports is

"report_*mm-dd-yy*.txt"

where *'mm'* is the month *number*, *'dd'* is the day, and *'yy'* indicates the year.

You can only change the installation report folder; the file name is auto-generated. In the following example *x* could be any available drive:

```
ReportLocation = "x:\autopilot\reports\installs\"
```

SilentInstallEnable (Enabling Unattended Installation)

Note: Setting the SilentInstallEnable parameter to true in the configuration file is functionally equivalent to supplying the “/silent” switch on the command-line. You cannot specify the SilentInstallEnable parameter on the command line.

Default: False

Setting this parameter to true causes AutoPilot Installer to operate with no user interaction.

SilentRebootEnable (Enabling Silent Reboot)

Default: False

If Windows must be restarted after a driver is installed, AutoPilot Installer's default behavior in unattended installations is not to restart the system. AutoPilot Installer continues with the installation and you must restart at a later time. Restarts often require you to login as part of the Windows start up process and without logging in, the installation process would hang if it restarted the system. However, Windows can be configured to start up without requiring you to login. You must make sure it is safe to restart the system during unattended installations if you are going to set this parameter to true.

InstallWithoutQFE (Enabling Installation if a QFE Check Fails)

Default: False

AutoPilot Installer checks for Microsoft’s Quick Fix Engineering updates (QFEs), also known as KB

(Knowledge Base) updates, based upon the checks you have specified in the [STORPORT.QFES] section. By default, the installation will terminate if the QFE check should fail. To enable a driver installation to proceed even if a check for QFEs should fail, set this parameter to true.

AutoPilot Configuration File

The AutoPilot Configuration file is organized into sections, grouped according to related commands. There are six main sections. Each section begins with a heading. The heading is required even if there are no settings in the section. The only section not required is the Installation Prompts section, which has the heading [STORPORT.CONFIGURATION]. That section cannot exist if AutoPilot Installer will be run in silent mode. You must delete or comment-out that entire section for unattended installation. The sections and their headings are:

- Configuration Identification [AUTOPILOT.ID] - This section appears at the beginning of every AutoPilot Configuration file. This section contains revision and label information. The revision entry identifies the file's version number and the date on which it was produced. The label entry is used to identify the configuration that the file supports. This section can appear only once in the AutoPilot Configuration file.
- Software Configuration [AUTOPILOT.CONFIG] -This section can contain settings that control and configure AutoPilot Installer and the OneCommand Manager application operation. This section can appear only once in the AutoPilot Configuration file.
- Installation Prompts [STORPORT.CONFIGURATION] - This section can contain questions that must be answered during the initial installation process. This section applies to attended installations only, this section must not be present in configuration files to be used with unattended installations.
- Driver Parameters [STORPORT.PARAMS] - This section can specify driver parameters. Parameters are read exactly as they are entered and are written to the registry.
- System Parameters [SYSTEM.PARAMS] - This section can adjust the operating system’s global disk timeout. The timeout is stored in the registry under the key HKML\CurrentControlSet\Services\disk and specified with the following string: TimeOutValue = 0x3C (where the number is the timeout value in seconds.)
- Additional Quick Fix Engineering (QFE) Checks [STORPORT.QFES] - This section can specify additional QFE check, also known as KB (Knowledge Base) updates, during installation. This section can appear anywhere within the file as long as it is not contained within another section.

Lines that begin with a semicolon are comments. Some of the comments are sample settings. To use the setting, remove the semicolon.

Using the Windows Environment Variable (%ProgramFiles%)

You can use the Windows ProgramFiles environment variable in the LocalDriverLocation and ReportLocation strings within the configuration file. This allows you to specify strings in a driver independent manner, allowing the same configuration file to be used on different systems where Windows may have been installed on different drives. To use this option, “%ProgramFiles%” must be the first component specified in the string. The portion of the string that follows will be appended to the contents of the ProgramFiles environment variable.

Note: The contents of the ProgramFiles environment variable is not terminated with a slash, so one must be provided in the string. Windows environment variables are not case-sensitive.

```
ReportLocation = "%ProgramFiles%\my company\reports"
```

Configuration Identification [AUTOPILOT.ID]

This section contains revision and label information. The revision entry identifies the file's version number and the date on which it was produced. The label entry is used to identify the configuration that the file supports. This section may appear only once in the APInstall.cfg file.

Software Configuration [AUTOPILOT.CONFIG]

The settings in this section affect the operation of AutoPilot Installer during installation. See “Software Configuration Parameters” on page 12 for information about settings that may be specified in this section.

Configuration Prompts/Vendor-Specific Questions [STORPORT.CONFIGURATION]

Note: You must remove or comment out the entire [STORPORT.CONFIGURATION] section for an unattended installation.

A [STORPORT.CONFIGURATION] section may exist in the AutoPilot Configuration file.The first items in this section are the driver parameters to be used regardless of how the questions are answered. This is followed by a subsection that contains questions (these may be vendor-specific questions). A line containing '[QUESTIONS]' marks the start of the subsection, and the end of it is marked by a line containing '[ENDQUESTIONS]'. Within the question subsection there can be as many questions as needed. Each question uses the format:

```
question= "question?", "explanation", "answer0", "answer1", "answer2",.... ,
"answern"
Where:
```

“*question?*” contains the text of the question to be asked.

“explanation” contains brief text to help explain the question. The explanation will appear below the question in a smaller font. If there is no explanatory text, empty quotes must be used in its place.

“*answer0*” contains the 1st answer to be displayed in the drop down list.

“*answer1”* contains the 2nd answer to be displayed in the drop down list.

“*answern”* contains the *n*th answer to be displayed in the drop down list.

For each question there can be as many answers as needed. For each answer there must be a corresponding "answer =" section with its corresponding driver parameters listed beneath it. The answer uses the format:

```
   answer = 0
      DriverParameter="Param1=value; Param2=value;"
   answer = 1
      DriverParameter="Param1=value; Param2=value;"
   ....
   answer = n
      DriverParameter="Param1=value; Param2=value;"
```

Example of [STORPORT.CONFIGURATION] section:

```
[STORPORT.CONFIGURATION]
   ;The first section contains the driver parameters common to all
configurations, no matter what answers are given.
```

```
   DriverParameter="EmulexOption=0;"
   [QUESTIONS]
      question = "What is your link speed?", "Note: select 'Auto-detect' if you
are unsure about the answer.", "4GB", "2GB", "1GB", "Auto-detect"
           ANSWER = 0
                DriverParameter = "LinkSpeed=4;"  ;4 GB
           ANSWER = 1
                DriverParameter = "LinkSpeed=2;"  ;2 GB
           ANSWER = 2
                DriverParameter = "LinkSpeed=1;"  ;1 GB
           ANSWER = 3
                DriverParameter = "LinkSpeed=0;"  ;Auto-detect
      question = "Describe the topology of your storage network.", "Note:
Select 'Arbitrated Loop' when directly connected to the array (no fibre
switch). Select 'Point-to-Point' when connected to a SAN (fibre switch).",
"Arbitrated Loop", "Point-to-Point"
           ANSWER = 0
                DriverParameter = "Topology=2;"
           ANSWER = 1
                DriverParameter = "Topology=3;"
   [ENDQUESTIONS]
[END.STORPORT.CONFIGURATION]
```

QFE Checks [STORPORT.QFES]

To add a Windows Quick-Fix Engineering (QFE) check to the configuration file, edit the [STORPORT.QFES] section in the AutoPilot Configuration file. You may place this section anywhere within the file as long as it is not contained within another section. This section contains a single line for each QFE that is to be checked. Up to 10 lines will be checked, more than that may exist but they will be ignored. All parameters in each line must be specified. These lines have the format

```
qfe = "qfe name", "path and file name", "file version", "applicable OS"
```

qfe name - The name of the item being checked. For example, QFE 838896. The name should facilitate searching Microsoft's website for any required code updates.

path and file name - This string identifies the file to be checked and its location relative to the Windows home folder. In most cases, the file to check will be the Microsoft Storport driver, for example, “\system32\drivers\storport.sys”. This string is also used in dialogs and log file messages.

file version - This is the minimum version that the file to be checked must have for the QFE to be considered installed. It is specified as a text string using the same format as is used when displaying the files property sheet. For example, “5.2.1390.176”.

applicable OS - This is used to determine if the QFE applies to the operating system platform present. The acceptable values are “Win2003” and “Win2008”.

Example

```
[STORPORT.QFES]
qfe = "QFE 83896", "\system32\drivers\storport.sys", "5.2.1390.176","Win2003"
```

Setting Up FC Driver Parameters [STORPORT.PARAMS]

To change driver parameters, modify this section of the AutoPilot Configuration file. Locate the [STORPORT.PARAMS] section in the AutoPilot Configuration file. This section follows Optional Configuration File Changes. Under the [STORPORT.PARAMS] heading, list the driver parameters and new values for the driver to use.

For example:

```
Driver Parameter = "LinkTimeout = 45"
```

See the *OneCommand Manager application version 5.1 User Manual* for a listing of driver parameters, defaults and valid values.

Setting Up System Parameters [SYSTEM.PARAMS]

To change the system parameters, create a [SYSTEM.PARAMS] section in the APInstall.cfg file. Create this section in the Optional Configuration File Changes heading in the [AUTOPILOT.CONFIG] section of the AutoPilot Configuration file.

AutoPilot Installer Exit Codes

AutoPilot Installer sets an exit code to indicate whether an installation was successful or an error occurred. These exit codes allow AutoPilot Installer to be used in scripts with error handling. In unattended installations, AutoPilot Installer sets the following exit codes:

Table 1: Unattended Installation Error Codes

Error Code	Hex	Description
0	0x00000000	No errors
2399141889	0x8F000001	Unsupported operating system detected.
2399141890	0x8F000002	The AutoPilot Configuration file is not found.
2399141891	0x8F000003	Disabled adapters detected in the system.
2399141892	0x8F000004	The selected driver is 64-bit and this system is 32-bit.
2399141893	0x8F000005	The selected driver is 32-bit and this system is 64-bit.
2399141894	0x8F000006	Installation activity is pending. AutoPilot Installer cannot run until it is resolved.
2399141895	0x8F000007	(GUI Mode only) User cancelled execution because user did not wish to perform a software-first install.
2399141896	0x8F000008	No drivers found.
2399141897	0x8F000009	One or more adapters failed diagnostics.
2399141904	0x8F000010	(GUI Mode only) User chose to install drivers even though a recommended QFE or Service Pack was not installed.
2399141920	0x8F000020	(GUI Mode only) User chose to stop installation because a recommended QFE or Service Pack was not installed.
2399141899	0x8F00000B	Unattended installation did not find any drivers of the type specified in the config file.
2399141900	0x8F00000C	A silent reboot was attempted, but according to the operating system a reboot is not possible.
2399141901	0x8F00000D	(GUI Mode only) A driver package download was cancelled.
2399141902	0x8F00000E	(Non-Enterprise) No adapters were found in the system.
2399141903	0x8F00000F	A required QFE or Service Pack was not detected on the system.
2399141836	0x8F000030	AutoPilot Installer was not invoked from an account with Administrator-level privileges.
2391419952	0x8F000040	AutoPilot Installer has detected unsupported adapters on the system.
2399141968	0x8F000050	Unattended software-first installations are disallowed.

Table 1: Unattended Installation Error Codes (Continued)

Error Code	Hex	Description
2399141984	0x8F000060	User cancelled APInstall before any driver/utility installation occurred.
2399142000	0x8F000070	User cancelled APInstall after driver/utility installation occurred.
2399142032	0x8F000090	APInstaller encountered an error while parsing the command line (Report file contains details).
2399142048	0x8F0000A0	NIC or iSCSI adapters are installed, but are not supported on IA64 systems.

AutoPilot Installer Installation Reports

During each installation, AutoPilot Installer produces a report describing events that occurred during the installation. This report has several sections.

The first section provides basic information including the time and date of the installation, the name of the machine that the installation was performed on, the version number of AutoPilot Installer, and the identification of the configuration file that was used.

The second section provides an inventory of the Emulex adapters as they were before AutoPilot Installer performed any actions.

The third section lists the tasks that AutoPilot will perform in the order they will be done.

The fourth section records the results of each task. When all driver installation tasks are completed, an updated adapter inventory is recorded.

Note: If you cancel AutoPilot Installer, that information is recorded along with when you cancelled the installation. The contents of any error dialogs that are displayed are also recorded.

Command Script Example

Modifying the configuration file enables you to script the installation of a system's driver. The following example command script (batch file) assumes that you have made mandatory changes to the AutoPilot Configuration file, as well as any desired optional changes.

If your systems were set up with a service that supports remote execution, then you can create a command script to remotely update drivers for all of the systems on the storage net. If Microsoft's RCMD service was installed, for example, a script similar to the following would run remote execution:

```
rcmd \\server1 g:\autopilot\x86_full_kit\apinstall
if errorlevel 1 goto server1ok
echo AutoPilot reported an error upgrading Server 1.
if not errorlevel 2147483650 goto unsupported
  echo Configuration file missing.
goto server1ok
 :unsupported
if not errorlevel 2147483649 goto older
echo Unsupported operating system detected.
 :older
if not errorlevel 2001 goto none
   echo The driver found is the same or older than the existing driver.
   goto server1ok
:none
if not errorlevel 1248 goto noreport
   echo No Emulex adapter found.
```

```
goto server1ok
:noreport
 if not errorlevel 110 goto nocfg
   echo Could not open installation report file.
 goto server1ok
:nocfg
 if not errorlevel 87 goto badcfg
   echo Invalid configuration file parameters.
   goto server1ok
:badcfg
   if not errorlevel 2 goto server1ok
   echo No appropriate driver found.
server1ok
rcmd \\server2 g:\autopilot\ApInstall
ConfigFileLocation=g:\autopilot\mysetup\apinstall.cfg
if errorlevel 1 goto server2ok
echo AutoPilot reported an error upgrading Server 2.
if not errorlevel 2147483650 goto unsupported
   echo Configuration file missing.
goto server2ok
 :unsupported
 if not errorlevel 2147483649 goto older
   echo Unsupported operating system detected.
 :older2
 if not errorlevel 2001 goto none2
   echo The driver found is the same or older than the existing driver.
   goto server2ok
:none2
 if not errorlevel 1248 goto noreport2
   echo No adapter found.
goto server2ok
:noreport
 if not errorlevel 110 goto nocfg2
   echo Could not open installation report file.
 goto server2ok
:nocfg2
 if not errorlevel 87 goto badcfg2
   echo Invalid configuration file parameters.
   goto server2ok
:badcfg2
   if not errorlevel 2 goto server2ok
   echo No appropriate driver found.
server2ok
```

Manual Installation and Updating Procedures

Manually Installing or Updating the Emulex Protocol Drivers

Overview

You can install or update the Emulex protocol drivers and utilities manually without using AutoPilot Installer.

The Emulex PLUS (ElxPlus) driver supports the OneCommand Manager application, persistent binding and LUN mapping and masking. The ElxPlus driver must be installed before you install the Emulex protocol drivers.

Removing the Adjunct Driver Registry Key

The ElxPlus driver replaces the adjunct driver that was used with Storport Miniport 1.11a3 or earlier. If currently installed, the adjunct driver registry key must be removed using the deladjct.reg file before you install the ElxPlus driver. The deladjct.reg file was extracted when you installed the old driver.

Installing the Emulex PLUS (ElxPlus) Driver for the First Time

To install the ElxPlus driver from the desktop:

Note: Only one instance of the Emulex PLUS driver should be installed, even if you have multiple adapter ports installed in your system.

1. Run the driver kit installer, but do not run AutoPilot Installer. See “Running a Software Installation Interactively” on page 6 for instructions on how to do this.
2. Select **Start>Settings>Control Panel>Add Hardware**. The Add Hardware Wizard window appears. Click **Next**.
3. Select **Yes, I have already connected the hardware** and click **Next**.
4. Select, **Add a new hardware device** and click **Next**.
5. Select **Install the hardware that I manually select from a list (Advanced)** and click **Next**.
6. Select **Show All Devices** and click **Next**.
7. Click **Have Disk....** Direct the Device Wizard to the location of elxplus.inf. If you have installed the driver installer kit in the default folder and C:\ is your Windows system drive, the path is:
   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\HBA for the 32-bit driver version

   or

   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\HBA for the x64 driver version

   or

   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\HBA for the Itanium driver version
8. Click **OK**.
9. Select **Emulex PLUS**. Click **Next** and click **Next** again to install the driver.
10. Click **Finish**. The initial ElxPlus driver installation is complete. Continue with manual installation of the Storport Miniport Driver. See “Installing or Updating the FC Storport Miniport Driver” on page 21 for this procedure.

Updating the Emulex PLUS (ElxPlus) Driver

To update an existing ElxPlus driver from the desktop:

Note: Only one instance of the Emulex PLUS driver should be installed, even if you have multiple adapter ports installed in your system.

1. Run the driver kit installer, but do not run AutoPilot Installer. See “Running a Software Installation Interactively” on page 6 for instructions on how to do this.
2. Select **Start>Settings>Control Panel>Administrative Tools>Computer Management.**
3. Click **Device Manager** (left pane).
4. Click the plus sign (+) next to the Emulex PLUS class (right pane) to show the ElxPlus driver entry.
5. Right-click the ElxPlus driver entry and select **Update Driver...** from the menu.
6. Select **No, not this time**. Click **Next** on the **Welcome to the Hardware Update Wizard** window. Click **Next**.
7. Select **Install from a list or specific location (Advanced)** and click **Next**.
8. Select **Don’t Search. I will choose the driver to install**.
9. Click **Have Disk....** Direct the Device Wizard to the location of driver’s distribution kit. If you have installed the driver installer kit in the default folder, the path is:
   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86 for the 32-bit driver version

   or
   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64 for the x64 driver version

   or
   - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64 for the Itanium driver version
10. Click **OK**. Select **Emulex PLUS**.
11. Click **Next** to install the driver.
12. Click **Finish**. The ElxPlus driver update is complete. Continue with manual installation of the Storport Miniport Driver.

Installing or Updating the FC Storport Miniport Driver

To update or install the FC Storport Miniport driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the “SCSI and RAID Controllers” item.
5. Double-click the desired Emulex adapter.

   Note: The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models will be displayed in Device Manager as two adapters, therefore each adapter must be updated.
6. Select the **Driver** tab.
7. Click **Update Driver.** The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.
9. Select **Install from a list or specific location (Advanced)** and click **Next**.

10. Select **Don't search. I will choose the driver to install** and click **Next**.

    Note: Using the OEMSETUP.INF file to update Emulex's FC Storport Miniport driver overwrites customized driver settings. If you are upgrading from a previous installation, write down the settings. Following installation, use the OneCommand Manager application to restore the pre-upgrade settings.

11. Click **Have Disk....** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\HBA for the 32-bit driver version

    or

    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\HBA for the x64 driver version

    or

    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\HBA for the Itanium driver version
12. Click **OK**. Select **Emulex LightPulse LPX000, PCI Slot X, Storport Miniport Driver** (your adapter model will be displayed here).
13. Click **Next**.
14. Click **Finish**.

The driver installation is complete. The driver should start automatically. If the adapter is connected to a SAN or data storage device, a blinking yellow light on the back of the adapter will indicate a link up condition.

Installing or Updating the iSCSI Driver

To update or install the iSCSI driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the “SCSI and RAID Controllers” item.
5. Double-click the desired Emulex adapter.
6. Select the **Driver** tab.
7. Click **Update Driver.** The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.

   Note: The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models will be displayed in Device Manager as two adapters, therefore each adapter must be updated.

9. Select **Install from a list or specific location (Advanced)** and click **Next**.
10. Select **Don't search. I will choose the driver to install** and click **Next**.
11. Click **Have Disk....** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x86\iSCSI\[Windows Version] for the 32-bit driver version

    or

- C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\x64\iSCSI\[Windows Version] for the x64 driver version

or

- C:\Program Files\Emulex\AutoPilot Installer\Drivers\Storport\IA64\iSCSI\[Windows Version] for the Itanium driver version

12. Click **OK**. Select **Emulex OneConnect OCmXXXXX, iSCSI Initiator** (your adapter model will be displayed here).
13. Click **Next**.
14. Click **Finish**.

The driver installation is complete. The driver should start automatically.

Installing or Updating the NIC Driver

Note: Although TOE is supported, it is turned off by default.

To update or install the NIC driver from the desktop:

1. Select **Start>Settings>Control Panel>System**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.
4. Open the "Network Adapters" item.
5. Double-click the desired Emulex adapter.
6. Select the **Driver** tab.
7. Click **Update Driver.** The Update Driver wizard starts.
8. Select **No, not this time**. Click **Next** on the Welcome to the Hardware Update Wizard window.

   Note: The driver will affect only the selected adapter. If there are other adapters in the system, you must repeat this process for each adapter. All DC adapter models are displayed in the Device Manager as two adapters, therefore each adapter must be updated.

9. Select **Install from a list or specific location (Advanced)** and click **Next**.
10. Select **Don't search. I will choose the driver to install** and click **Next**.
11. Click **Have Disk....** Direct the Device Wizard to the location of oemsetup.inf. If you have installed the driver installer kit to the default folder, the path is:
    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\x86\NIC\[Windows Version] for the 32-bit driver version

    or

    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\x64\NIC\[Windows Version] for the x64 driver version

    or

    - C:\Program Files\Emulex\AutoPilot Installer\Drivers\NDIS\IA64\NIC\[Windows Version] for the Itanium driver version

12. Click **OK**. Select **Emulex OneConnect OCeXXXXX, NIC/TOE** (your adapter model will be displayed here).
13. Click **Next**.
14. Click **Finish**.

The driver installation is complete. The driver should start automatically.

Uninstallation

Uninstalling the AutoPilot Installer

To uninstall AutoPilot Installer on a Windows Server 2003 system:

1. Open the **Add or Remove Programs** control panel.
2. Select **Emulex iSCSI Driver kit-2.103.160.01** in the program list and click **Remove**.
3. Click **Yes**. The application is removed from the system. Click **OK**.

To uninstall AutoPilot Installer on a Windows Server 2008 system:

1. Open the **Programs and Features** control panel.
2. Select **Emulex iSCSI Driver kit-2.103.160.01** in the program list and click the **Uninstall** icon in the tool bar above the program list. If you have User Access Control enabled, click **Continue** when asked for permission.
3. Click **Yes**. The application is removed from the system. Click **OK**.

To uninstall AutoPilot Installer on a Server Core system:

1. cd to the “Program Files” folder on an x86 system or the “Program Files (x86)” folder on a 64-bit system.
2. cd to “Emulex\AutoPilot Installer”.
3. Run “uninstall_elx_core_kit.bat”. The installer files are removed from the system.

On all platforms, the reports folder in the “Emulex\AutoPilot Installer” folder is not removed, so you can still view installation history and see which drivers have been installed on the system. You may delete the reports folder at any time if you want.

Uninstalling the Emulex Drivers

The Emulex Storport Miniport and PLUS (ElxPlus) drivers are uninstalled using the Device Manager.

Note: On Windows 2008, after the message: "Warning - you are about to uninstall this device from your system", is displayed. You will need to select the checkbox "Delete the software for this device" in order to uninstall the driver.

To uninstall the Emulex Storport Miniport driver:

1. Select **Start>All Programs>Administrative Tools>Computer Management**.
2. Click **Device Manager**.
3. Double-click the adapter from which you want to remove the Storport Miniport driver. A device-specific console window is displayed. Select the **Driver** tab.
4. Click **Uninstall** and click **OK** to uninstall.

To uninstall the ElxPlus driver (uninstall the ElxPlus driver only if all adapters and installations of Emulex miniport drivers are uninstalled):

After running Device Manager (steps 1 and 2 above):

1. Click the plus sign (+) next to the Emulex PLUS driver class.
2. Right-click the Emulex driver and click **Uninstall**.
3. Click **OK** in the Confirm Device Removal window.

To uninstall or update an earlier version of the Storport Miniport driver (prior to version 1.20), you must

remove the registry settings for the adjunct driver prior to manually installing a new driver.

To remove the adjunct driver registry settings:

1. Browse to the Storport Miniport driver version 1.20 (or later) driver kit that you downloaded and extracted.
2. Double-click on the deladjct.reg file. A Registry Editor window appears to confirm that you want to execute deladjct.reg.
3. Click **Yes**. The elxadjct key is removed from the registry.

Driver Parameters for Windows

The parameter values listed in Table 2 are applicable to Storport Miniport driver versions 2.40.005 or later. If you are using a version previous to 2.40.005, see the Storport Miniport Driver User Manual for that version's parameter information.

Activation Requirements

A parameter has one of the following activation requirements:

- Dynamic - The change takes effect while the system is running.
- Reset - Requires an adapter reset from the utility before the change takes effect.
- Reboot - Requires reboot of the entire machine before the change takes effect. In this case, you are prompted to perform a reboot when you exit the utility.

The Driver Parameter table provides information such as the allowable range of values and factory defaults. Parameters can be entered in decimal or hexadecimal format.

Note: If you are creating custom unattended installation scripts, any driver parameter can be modified and included in the script.

Note: If the Adapter/Protocol is blank it indicates that the parameter is supported on both Lightpulse as well as OneConnect adapters. "Lightpulse only" indicates parameters supported only on Lightpulse and not on OneConnect adapters. "FC only" indicates parameters supported on non-Lightpulse FC adapters.

Most parameters default to a setting that optimizes adapter performance.

Table 2: Storport Miniport Driver Parameters

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
AutoMap=**n**	AutoMap controls the way targets are assigned SCSI IDs. Discovered targets are assigned persistent SCSI IDs according to the selected binding method. Persistent bindings do not take effect with the driver in stand-alone mode. If set to 0 = automap is disabled. Uses the HBAnyware utility to persistently set the SCSI address of a discovered FCP capable FC node (target). If set to 1 = automap by WWNN. If set to 2 = automap by WWPN. If set to 3 = automap by DID Value: 0 - 3 Default = 2	Reboot	

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
Class=**n**	Class selects the class of service on FCP commands. If set to 2, class = 2. If set to 3, class = 3. Value: 2 - 3 Default = 3	Dynamic	FC only
CoalesceMsCnt=**n**	CoalesceMsCn specifies wait time in milliseconds to generate an interrupt response if CoalesceRspCnt has not been satisfied. Zero specifies an immediate interrupt response notification. A non-zero value enables response coalescing at the specified interval in milliseconds. Value: 0 - 63 (decimal) or 0x0 - 0x3F (hex) Default = 0 (0x0)	Reset	Lightpulse only
CoalesceRspCnt=**n**	CoalesceRspCn specifies the number of response entries that trigger an Interrupt response. Value: 0 - 255 (decimal) or 0x1 - 0xFF (hex) Default = 8 (0x8)	Reset	Lightpulse only
DiscoveryDelay=**n**	DiscoveryDelay controls whether the driver waits for ‘n’ seconds to start port discovery after link up. If set to 0 = immediate discovery after link up. If set to 1 or 2 = the number of seconds to wait after link-up before starting port discovery. Value: 0 - 2 seconds (decimal) Default = 0.	Dynamic	
DriverTraceMask	The DriverTraceMask feature is only available on OS that supports extended system event logging. The value of 0 = Disabled this feature, 1 = Error events logging, 4 = Warning events logging and 8 = Informational events logging. The values can be masked to generate multi-levels of events logging. Values: 0, 1, 4 and 8. Default =0.	Dynamic	

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
EnableAck0=**n**	Set to 1 to force sequence rather than frame level acknowledgement for class 2 traffic over an exchange. This applies to FCP data exchanges on IREAD and IWRITE commands. Value: 0 - 1 (decimal) Default = 1	Reset	FC only
EnableAUTH	EnableAUTH enables fabric authentication. This feature requires the authentication to be supported by the fabric. Authentication is enabled when this value is set to 1. Value: 0 - 1 Default = 0	Reboot	
EnableFDMI=**n**	If set to 1, enables management server login on fabric discovery. This allows Fabric-Device Management Interface (FDMI) to operate on switches that have FDMI-capable firmware. If set to 2, FDMI operates and uses the host name feature of FDMI. Value: 0 -2 (decimal) Default = 0	Reset	
EnableNPIV=**n**	If set to 1, enables N_Port_ID virtualization (NPIV). Requires NPIV supported firmware for the adapter. Value: 0 -1 Default = 0 (disabled) **Note:** To run the driver using NPIV or SLI-3 optimization, the firmware must be version 2.72a0 or later. If an earlier version is used, the driver runs in SLI-2 mode and does not support NPIV. **Note:** NPIV is not available on 1Gb/s and 2 Gb/s adapters.	Reboot	
ExtTransferSize	ExtTransferSize is an initialization-time parameter that affects the maximum SGL that the driver can handle, which determines the maximum I/O size that a port will support. At the default of 0, the maximum transfer size is 512KB. With a value of 1, the maximum transfer size is 1MB. With a value of 2, the maximum transfer size is 2MB. Value: 0 - 2 Default = 0 (disabled)		Lightpulse only

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
FrameSizeMSB=**n**	FrameSizeMSB controls the upper byte of receive FrameSize if issued in PLOGI. This allows the FrameSize to be constrained on 256-byte increments from 256 (1) to 2048 (8). Value: 0 - 8 Default = 0	Reset	
InitTimeout=**n**	Determines the number of time-out seconds during driver initialization for the link to come up. If the link fails to come up by InitTimeout, driver initialization exits but is still successful. If the link comes up before InitTimeout, the driver sets double the amount for discovery to complete. Value: 5 -30 seconds or 0x5 - 0x1E (hex) Default = 15 seconds (0xF)	Reboot	
LimTransferSize	Limits maximum transfer size when non-zero to selectable values. Values: 0 = Port Default 1 = 64Kb 2 = 128 Kb 3 = 256Kb	Reboot	
LinkSpeed**=n**	LinkSpeed has significance only if the adapter supports speeds other than one Gb/s. Value: Auto-select, 1 Gb/s, 2 Gb/s, 4 Gb/s, 8 Gb/s Default = Auto-select **Note:** Setting this option incorrectly can cause the adapter to fail to initialize.	Reset	FC only
LinkTimeOut=**n**	LinkTimeOut applies to a private loop only. A timer is started on all mapped targets using the link timeout value. If the timer expires before discovery is re-resolved, commands issued to timed out devices returns a SELECTIION_TIMEOUT. The Storport driver is notified of a Bus change event which leads to the removal of all LUNs on the timed out devices. Value: 1 - 500 seconds or 0x0 - 0xFE (hex) Default = 30 (0x1E)	Dynamic	

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
LogErrors=**n**	LogErrors determine the minimum severity level required to enable entry of a logged error into the system event log. Errors are classified as severe, malfunction or command level. A severe error requires user intervention to correct a firmware or adapter problem. An invalid link speed selection is an example of a severe error. A malfunction error indicates that the system has problems, but user intervention is not required. An invalid fabric command type is an example of a malfunction error. A command level error: an object allocation failure is an example of a command error. If set to 0, all errors are logged. If set to 1, command level errors are logged. If set to 2, malfunction errors are logged. If set to 3, severe errors are logged. Value: 0 - 3 Default = 3	Dynamic	
NodeTimeout=**n**	The node timer starts when a node (i.e. discovered target or initiator) becomes unavailable. If the node fails to become available before the NodeTimeout interval expires, the OS is notified so that any associated devices (if the node is a target) can be removed. If the node becomes available before NodeTimeout expires the timer is canceled and no notification is made. Value: 1 - 255 seconds or 0x0 - 0xFF (hex) Default = 30 (0x1E)	Dynamic	
QueueDepth=**n**	QueueDepth requests per LUN/target (see QueueTarget parameter). If you expect the number of outstanding I/Os per device to exceed 32, then you must increase to a value greater than the number of expected I/Os per device (up to a value of 254). If the QueueDepth value is set too low, a performance degradation can occur due to driver throttling of its device queue. Value: 1 - 254 or 0x1 - 0xFE (hex) Default = 32 (0x20)	Dynamic	

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
QueueTarget=**n**	QueueTarget controls I/O depth limiting on a per target or per LUN basis. If set to 0 = depth limitation is applied to individual LUNs. If set to 1 = depth limitation is applied across the entire target. Value: 0 -1 or 0x0 - 0x1 (hex) Default = 0 (0x0)	Dynamic	
RmaDepth=**n**	RmaDepth sets the remote management buffer queue depth. The greater the depth, the more concurrent management controls can be handled by the local node. Value: 8 - 64, or 0x8 - 0x40 (hex) Default = 16 (0x10) **Note:** The RmaDepth driver parameter pertains to the functionality of the HBAnyware utility.	Reboot	
ScanDown=**n**	If set to 0 = lowest AL_PA = lowest physical disk (ascending AL_PA order). If set to 1 = highest AL_PA = lowest physical disk (ascending SEL_ID order). Value: 0 - 1 Default = 1 **Note:** This option applies to private loop only in DID mode.	Reboot	FC only
SLIMode=**n**	If set to 0 = autoselect firmware, use the newest firmware installed. If set to 2 = implies running the adapter firmware in SLI-2 mode. If set to 3 = implies running the adapter firmware in SLI-3 mode. Value: 0, 2 and 3 Default = 0	Reboot	Lightpulse only

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
Topology=**n**	Topology values can be 0 to 3. If set to 0 (0x0) = FC Arbitrated Loop (FC-AL). If set to 1 (0x1) = PT-PT fabric. If set to 2 (0x2) = *FC-AL first, then attempt PT-PT. If set to 3 (0x3) = *PT-PT fabric first, then attempt FC-AL. * Topology fail-over requires v3.20 firmware or higher. If firmware does not support topology fail-over, options 0,2 and 1,3 are analogous. Value: 0 - 3 Default = 2 (0x2)	Reset	FC only
TraceBufSiz=**n**	TraceBufSiz sets the size in bytes for the internal driver trace buffer. The internal driver trace buffer acts as an internal log of the driver's activity. Value: 250,000 - 2,000,000 or 0x3D090 - 0x1E8480 (hex). Default = 250,000 (0x3D090)	Reboot	
ConfigScale	ConfigScale sets the memory footprint profile in accord with the anticipated use case on a per-port basis. The default value of 1 is considered to be the typical use case. For all values except 0, up to 1024 targets can be discovered and mapped. For a value of 0, only 128 targets can be discovered and mapped. On a OneConnect adapter, a value of 0 limits max XRIs to 512. On a OneConnect adapter, a value of 1 limits max transfer size to 512 Kb, a value of 2 limits max transfer size to 2Mb-4K. ConfigScale supersedes ExtTransferSize for OneConnect adapters. Use ConfigScale = 0 to minimize the driver's per-port memory foot print on any adapter model. Use ConfigScale = 2 if connecting to tape devices on a OneConnect port. Use ConfigScale = 3 if running performance benchmarks in a non-production environment. Values: 0, 1, 2 and 3 Default = 1		

Table 2: Storport Miniport Driver Parameters (Continued)

Parameter	Definitions	Activation Requirement	Adapter/ Protocol
SrbTimeout	SrbTimeout limits the SRB timeout value to 60 seconds when set to 1: Enabled. This is a non-displayed parameter where it has to be set manually into the registry. This option alters the I/O timeout behavior where an I/O will be returned in a max timeout of 60 seconds on some long I/O timeout. Values: 0, 1 Default = 0		

Driver Configuration

FC/FCoE Driver Configuration

The Emulex Storport Miniport driver has many options that you can modify to provide for different behavior. You can set Storport Miniport driver parameters using the OneCommand Manager application. Refer the *OneCommand Manager application version 5.1 User Manual* for information on using this utility to configure the driver.

iSCSI and NIC Driver Configuration

Note: Although TOE is supported, it is turned off by default.

Windows Server NIC/TOE Driver Parameters

The Windows Server NIC/ TOE drivers support driver options through the Advanced Property page in Windows Device Manager.

Modifying Advanced Properties

Modify the Advanced Properties for the driver for Windows with the Windows Device Manager. For more information on advanced properties, see “Network Driver Performance Tuning” on page 40.

To modify the Advanced Properties:

1. Enter the Windows Device Manager by:
   - Clicking **Start> Control Panel>System** and click the **Device Manager** hyperlink,

   or

   - Clicking **Start>Run**, then type `devmgmt.msc` and click **OK**.

   The Windows Device Manager is displayed.

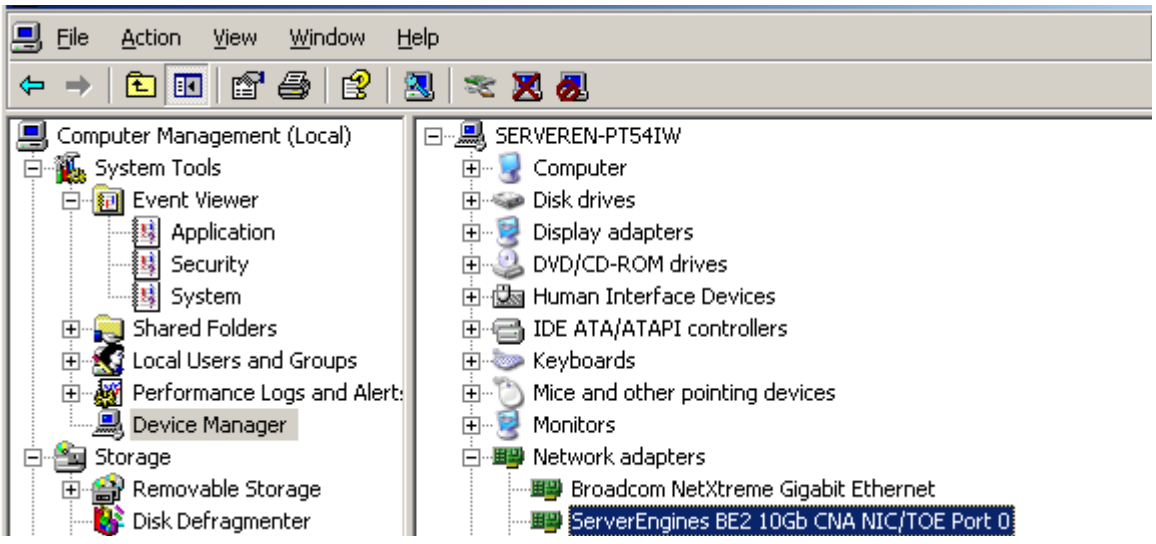

Figure 2: Partial View of Windows Device Manager

2. Right click the network adapter for which you wish to modify advanced properties.

3. Click **Properties,** then click the **Advanced** tab.
4. From the list of properties, click on the Property (parameter) you want to modify, then select the new value of the property by clicking the down arrow on the Value pull-down field.
5. Click **OK**. Figure 3 is an example of the Advanced tab.

Note: Modifying properties this way causes the network driver to reload and some TCP connections may be temporarily dropped.

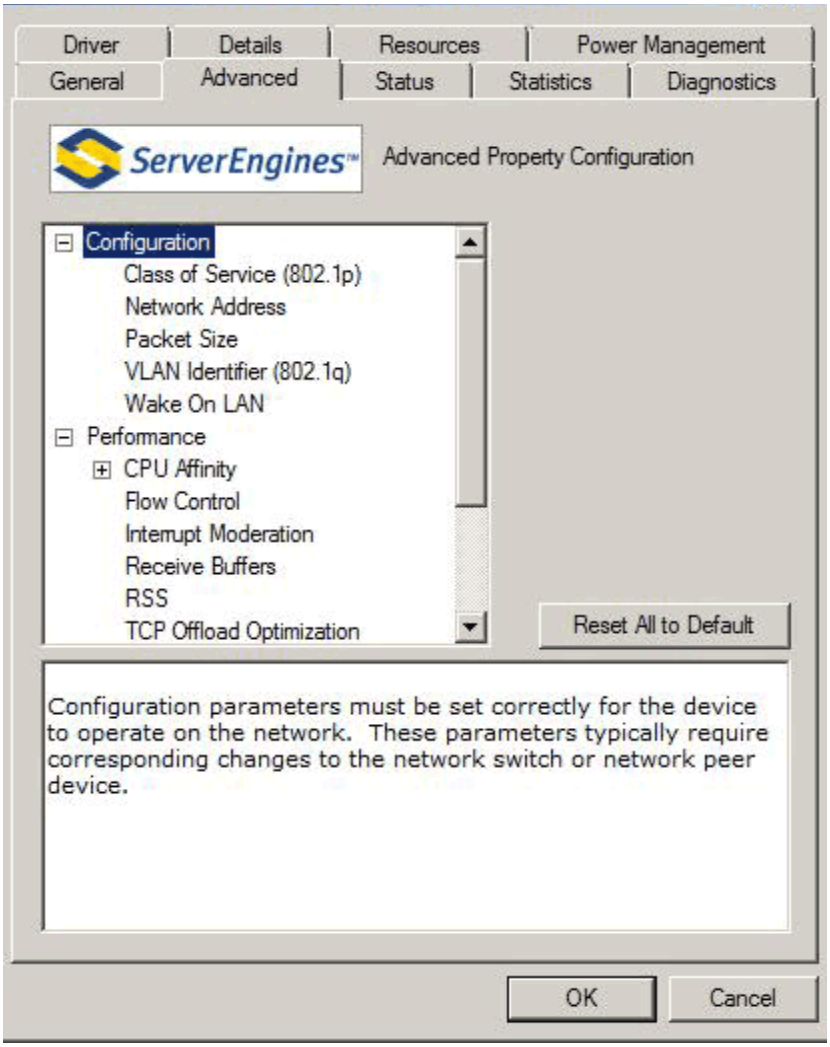

Figure 3: NIC/TOE Advanced Properties in Windows Server 2003 and Windows Server 2008

Configuring NIC/TOE Driver Options

The Windows Server NIC/ TOE drivers support the following OneConnect configurable driver options through the Advanced Property page in Windows Device Manager. For information on how to configure the options through the Advanced Property page, see “Modifying Advanced Properties” on page 34.

For more information on the options, see “Network Driver Performance Tuning” on page 40.

Table 3: Windows Server 2003 Driver Options

Option Name	Default Value	Acceptable Values	Definition
Flow Control	RX and TX Enabled	Disable RX and TX Enabled Rx Enable/Tx Disable Tx Enable/Rx Disable	Flow Control settings.
Interrupt Moderation	Default Adaptive	Aggressive Adaptive Default Adaptive Minimal Adaptive Minimal Static None	Interrupt Moderation settings.
IP Checksum Offload	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	IP Checksum Offload settings.
Large Send Offload v1	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Network Address	None	Valid MAC Address	Locally Administered MAC Address - System Managed. **Note:** There is no boundary checking for this field. It is the administrator's responsibility to set this field correctly.
Packet Size	1514	1514 9014	Configure packet size for OneConnect NIC only. Limit normal sized frames and one value for jumbo packet.
RSS	Enable	Disable Enable	Disable or enable for RSS Offload. Support for up to 4 RSS queues if enabled.
TCP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Connection Offload (IPv4)	Enable	Enable Disable	Enable/disable for TCP Connection Off load.
UDP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.

Table 3: Windows Server 2003 Driver Options (Continued)

Option Name	Default Value	Acceptable Values	Definition
VLAN Identifier	Not Present	Not Present or a Value from 1 to 4095	VLAN Tagging Enable/Disable - Not Present to disable. Otherwise, the VLAN identifier for the driver to use.

Table 4: Windows Server 2008 Driver Options

Option Name	Default Value	Acceptable Values	Definition
Flow Control	RX and TX Enabled	Disable RX and TX Enabled Rx Enable/Tx Disable Tx Enable/Rx Disable	Flow Control settings
Interrupt Moderation	Default Adaptive	Aggressive Adaptive Default Adaptive Minimal Adaptive Minimal Static None	Interrupt Moderation settings.
IP Checksum Offload	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	IP Checksum Offload settings.
Large Send Offload v1	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Large Send Offload v2 (IPv4)	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Large Send Offload v2 (IPv6)	Enable	Disable Enable	Enable/Disable for Large Send Offload.
Network Address	None	Valid MAC Address	Locally Administered MAC Address - System Managed. **Note:** There is no boundary checking for this field. It is the administrator's responsibility to set this field correctly.
Packet Size	1514	1514 9014	Configure packet size for OneConnect NIC only. Limit normal sized frames and one value for jumbo packet.
RSS	Enable	Disable Enable	Disable or enable for RSS Offload. Support for up to 4 RSS queues if enabled.

Table 4: Windows Server 2008 Driver Options (Continued)

Option Name	Default Value	Acceptable Values	Definition
TCP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Checksum Offload (IPv6)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	Enable/disable for TCP Offload.
TCP Connection Offload (IPv4)	Enable	Disable Enable	Enable/disable for TCP Connection Offload.
TCP Connection Offload (IPv6)	Enable	Disable Enable	Enable/disable for TCP Connection Offload.
UDP Checksum Offload (IPv4)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.
UDP Checksum Offload (IPv6)	RX and TX Enabled	Disable RX and TX Enabled RX Enabled TX Enabled	UDP Offload Checksum settings.
VLAN Identifier	Not Present	Not Present or a Value from 1 to 4095	VLAN Tagging Enable/Disable - Not Present to disable. Otherwise, the VLAN identifier for the driver to use.

Server Performance

I/O Coalescing

I/O Coalescing is enabled and controlled by two driver parameters: CoalesceMsCnt and CoalesceRspCnt. The effect of I/O Coalescing will depend on the CPU resources available on the server. With I/O Coalescing turned on, interrupts are batched, reducing the number of interrupts and maximizing the number of commands processed with each interrupt. For heavily loaded systems, this will provide better throughput.

With I/O Coalescing turned off (the default), each I/O processes immediately, one CPU interrupt per I/O. For systems not heavily loaded, the default will provide better throughput.The following table shows recommendations based upon the number of I/Os per adapter.

Table 5: Recommended Settings for I/O Coalescing

I/Os per Second	Suggested CoalesceMsCnt	Suggested CoalesceRspCnt
I/Os < 10000	0	8

Table 5: Recommended Settings for I/O Coalescing (Continued)

I/Os per Second	Suggested CoalesceMsCnt	Suggested CoalesceRspCnt
10000 < I/Os < 18000	1	8
18000 < I/Os < 26000	1	16
1/Os > 26000	1	24

CoalesceMsCnt

The CoalesceMsCnt parameter controls the maximum elapsed time in milliseconds that the adapter waits before it generates a CPU interrupt. The value range is 0 - 63 (decimal) or 0x0 - 0x3F (hex). The default is 0 and disables I/O Coalescing.

CoalesceRspCnt

The CoalesceRspCnt parameter controls the maximum number of responses to batch before an interrupt generates. If CoalesceRspCnt expires, an interrupt generates for all responses collected up to that point. With CoalesceRspCnt set to less than 2, response coalescing is disabled and an interrupt triggers for each response. The value range for CoalesceRspCnt is 1 - 255 (decimal) or 0x1 - 0xFF (hex). The default value is 8.

Note: A system restart is required to make changes to CoalesceMsCnt and/or CoalesceRspCnt.

Performance Testing

There are three driver parameters that need to be considered (and perhaps changed from the default) for better performance testing: QueueDepth, CoalesceMsCnt and CoalesceRspCnt.

Note: Parameter values recommended in this topic are for performance testing only and not for general operation.

QueueDepth

If the number of outstanding I/Os per device is expected to exceed 32, increase this parameter to a value greater than the number of expected I/Os per device, up to a maximum of 254.The QueueDepth parameter defaults to 32. If 32 is set and not a high enough value, performance degradation may occur due to Storport throttling its device queue.

CoalesceMsCnt

CoalesceMsCnt defaults to zero. If you are using a performance evaluation tool such as IOMETER and if you expect the I/O activity will be greater than 8000 I/Os per second, set CoalesceMsCnt to 1 and reinitialized with an adapter reset or system reboot.

CoalesceRspCnt

CoalesceRspCnt defaults to 8. For all other values up to the maximum of 63, the adapter will not interrupt the host with a completion until either CoalesceMsCnt milliseconds has elapsed or CoalesceRspCnt responses are pending. The value of these two driver parameters reduces the number of interrupts per second which improves overall CPU utilization. However, there is a point where the number of I/Os per second is small relative to CoalesceMsCnt and this will slow down the completion process, causing performance degradation.

Performance Testing Examples

Test Scenario One

You execute IOMETER with an I/O depth of 1 I/O per device in a small-scale configuration (16 devices). In this case, the test does not exceed the adapter 's performance limits and the number of I/Os per second are in the low thousands.

Recommendation: set CoalesceMsCnt to 0 (or leave the default value).

Test Scenario Two

You execute IOMETER with an I/O depth of 48 I/Os per device in a small-scale configuration (16 devices).

Recommendation: set QueueDepth to be greater than 48 (e.g. 64).

Network Driver Performance Tuning

Network driver performance tuning improves performance of the network and TCP Offload driver for the Windows Server operating system. The OneConnect UCNA is an x8, Generation 2 ("Gen 2", or Gen2) PCI-Express device and requires substantial memory bandwidth in a system to support 10 Gb/s data streams.

Improving Performance with PCI-Express Bandwidth

OneConnect UCNA performance may be improved by selecting a more efficient PCI-Express packet payload size. If the system BIOS allows selection of a larger PCI-Express packet size, selecting at least a 512-byte PCIe packet payload size provides the best efficiency for PCIe data transfers.

Improving Performance with TCP Offload

TCP offload helps memory bandwidth significantly by eliminating the data copy of receive packets. This higher memory bandwidth leads to better network performance.

Most computers offer multiple distinct memory channels, or memory interleaves, which may not be enabled by default. Check the manufacturer's documentation and BIOS parameters for details ion enabling optimal memory bandwidth features. Typically, all the DIMM slots must be populated to make use of all the memory channels. As a general rule, more DIMMs provide better performance by allowing a higher degree of memory-access interleaving to occur.

Some servers may allow memory mirroring, where the total memory is divided in half and each location is stored twice. This allows fault recovery if one memory location detects an error, but it greatly reduces the perceived memory bandwidth of the system.

Nearly any desktop or low-end server has enough memory bandwidth for OneConnect UCNA to support DMA at 20 Gb/s of data (10 Gb/s read, 10 Gb/s write). However, most of the memory demands come from the processor accessing the data for either packet copies in the non-offloaded networking stack or application accesses. All processor memory accesses use the front side bus (FSB). The clock speed of this bus is critical for allowing efficient memory bandwidth.

Note: Systems with a faster Processor Front Side Bus (FSB) clock speed perform better than those with slower FSB clock speeds.

Windows Server Network Driver

Table 6 describes ways to use various OneConnect driver properties and Microsoft Windows properties to performance tune a system.

Table 6: Windows Server Performance Tuning Situations

Situation	Answer/Solution
There are a large number of short lived TCP connections such as Web Server or e-mail server.	Enable RSS, disable TCP offload.
There are large data transfers such as File Server, Web Server with file downloads, or FTP Server.	Use TCP offload.
There are large data transfers such as to a Backup Server.	Enable Jumbo Packets, use TCP offload.
There is a small server struggling to keep up with larger servers on the network.	Disable RSS, Enable TCP offload, Enable Jumbo Packets.
There is a general purpose server such as Active Directory Server, DHCP Server, or a DNS Server.	Use TCP offload, Enable RSS.

Analyzing Performance Problems

You can use the Windows Performance Monitor (perfmon) to view statistics for each network device.

To view statistics for each network device:

1. Click **Start > Run > perfmon** to launch the Windows Performance Monitor.
2. Right-click and select **Add Counters** to add additional statistics.

Table 7 lists a few statistics to use for troubleshooting performance problems. For network performance, all the counters from the table are useful: Network Interface, TCPv4, IPv4, and Processor.

Table 7: Statistics and Fine Tuning

Situation	Answer/Solution
Network Interface > Packets Received Errors.	If this is incrementing even a small amount, a physical problem may exist on the network, such as a loose connection or bad cable, causing CRC errors in Ethernet packets. Find and eliminate the physical problem.
Network Interface > Packets Received Discarded.	If this is incrementing dramatically, the computer system may be receiving a lot of unsolicited traffic using network resources.
IPv4 > Fragmented Datagrams / sec.	If this is greater than 0, the computer system is sending or receiving IP fragments. This is a serious performance problem.
TCPv4 > Segments Retransmitted / sec.	TCP retransmits indicate that packets are being dropped by the receiving system (or in a network switch). Ideally, reduce retransmits to 0.
Processor >% Processor Time.	If CPU usage is high, try to enable all available offloads, such as TCP Offload, Checksum Offloads and use Jumbo Packets.

Jumbo Packet

The jumbo packet setting in the registry determines the maximum Ethernet packet size. It includes the Ethernet frame header (typically 14 bytes) but excludes the trailing Cyclic Redundancy Check (CRC). The standard packet size is 1514 bytes plus a 4 byte trailing CRC.

Vendors use many terms that refer to this same quantity, such as packet size, frame size, or MTU. The Maximum Transmission Unit (MTU) is the Ethernet packet payload size. This does not include the Ethernet frame header or the trailing CRC. The standard MTU is 1500 bytes, corresponding to a 1514 packet size plus a 4 byte trailing CRC. Historically, any 1514 byte frame is a standard packet, while any frame larger than 1514 is called a jumbo packet. Windows Server attempts to standardize the terminology across vendors so the Jumbo Packet parameter refers to the byte size of the packet.

The Windows Server driver supports 1514 byte and 8188 byte jumbo packet values. The larger packet size provides better throughput and CPU usage. Typically, all devices on the network, including switches, must be configured for the larger size. The drawbacks of using jumbo packets are interoperability and increased memory usage on the server.

The path MTU is the maximum MTU that can be used before IP fragmentation occurs, taking into account the MTU for the endpoints and all routers between the endpoints. To verify the path MTU, ping a remote target with an increasing payload size. Eventually, the IP packet length exceeds the path MTU, and the packet fragments. This can be seen by using a packet sniffing application, such as Ethereal, Wireshark, or Microsoft Network Monitor.

IP fragmentation degrades performance dramatically, since all fragments must be received and reassembled before delivering the network packet to the upper layer protocol. In many cases, IP fragmentation may lead to a 10x performance degradation. The MTU parameter should be modified on all systems to avoid IP fragmentation for optimal network throughput.

Typical Use Cases

Typical cases for using the MTU:

- Server interconnects are typically deployed using jumbo frames. This is the most efficient configuration for high bandwidth server-to-server communication, such as Network Attached Storage, and database transactions.
- Servers connected to client systems that run desktop operating systems typically use standard 1500 byte frames. Most desktop systems do not support jumbo packets.
- Servers that need both high performance server-to-server communication and client access may be configured with jumbo frames with Path MTU Discovery enabled. Path MTU Discovery is enabled by default in Windows Server, and it allows TCP connections to negotiate the optimal packet size that avoids IP fragmentation.

Flow Control

The OneConnect UCNA supports IEEE 802.3x standard flow control, which uses control packets to temporarily pause the transmission of packets between two endpoints. These control messages are point-to-point, they are not forwarded by switches or routers. You must configure both endpoints for flow control. The OneConnect UCNA can either respond to flow control packets (by temporarily pausing transmits) or send flow control PAUSE packets when the transmitter is overwhelming the system's receive bandwidth.

Flow control has limited usefulness at 10Gb network speeds because it only allows the receiver to completely turn off the incoming flow of packets - it cannot just slow down the rate. Current 10Gb devices tend to cause a dip in performance because the exceedingly fast pipeline of packets will drain before the flow control can resume sending. The ideal situation is continuous pipeline of packets flowing between the endpoints, not a start-and-stop flow.

Flow Control Examples

Flow control greatly improves the following situations:

- The OneConnect UCNA is installed in 4x PCI-Express slot or an underpowered server system.

  If the PCI-Express bus does not provide 10 Gb/s of throughput due to chipset limitations or the bus width, the OneConnect UCNA cannot maintain 10 Gb/s of incoming receive data. It starts dropping packets quickly. In this situation it may be beneficial to enable RX flow control in the OneConnect UCNA, and enable flow control in the attached switch for all devices. This helps backpressure (i.e. slow down) the transmitters.

- The OneConnect UCNA transmits to 1 Gb devices, especially non-TCP protocol.

  If the OneConnect UCNA transmits to a 10 Gb/s switch with attached 1 Gb clients, the OneConnect UCNA may overwhelm the switch. The switch is then forced to start dropping packets because although it may receive a 10 Gb/s stream, the client can only sink a 1 Gb stream. In this situation, it may be beneficial to enable TX flow control in the OneConnect UCNA, and enable flow control for the 10 Gb/s switch port.

For information on modifying the Flow Control parameter, see “Modifying Advanced Properties” on page 34.

Checksum Offloading and Large Send Offloading (LSO)

The OneConnect UCNA supports IP, TCP, and UDP checksum offloading. All these protocols are enabled by default. You can disable offloading through the Windows Device Manager Advanced Properties. Disabling checksum offloading is only useful for packet sniffing applications, such as Ethereal or Microsoft Network Monitor, on the local system where the OneConnect UCNA is installed and monitored. When sniffing packets, transmit packets may appear to have incorrect checksums since the hardware has not calculated it yet.

The OneConnect UCNA supports transmit Large Send Offloading (LSO), which allows the TCP stack to send one large block of data and the hardware segments it into multiple TCP packets. This is recommended for performance, but it can be disabled for packet sniffing applications. LSO sends appear like giant packets in the packet sniffer, since the hardware has not segmented it yet.

For information on modifying the Large Send Offload parameter, see “Modifying Advanced Properties” on page 34.

Receive Side Scaling (RSS) for Non-Offloaded IP/TCP Network Traffic

The OneConnect UCNA can process TCP receive packets on four processors in parallel, per port (or PCI function), for a total of eight processors in parallel. This is ideal for applications that are CPU limited. Typically, these applications have numerous client TCP connections that may be short-lived. Web Servers or Database Servers are prime examples. RSS typically increases the number of transactions per second for these applications.

Understanding RSS

To better understand RSS, it helps to understand the interrupt mechanism used in the network driver. Without RSS a network driver receives an interrupt when a network packet arrives. This interrupt may occur on any CPU, or it may be limited to a set of CPUs for a given device depending on the server architecture. The network driver launches one deferred procedure call (DPC) that runs on the same CPU as the interrupt. Only one DPC ever runs at a given moment in time. In contrast, with RSS enabled, the OneConnect network driver launches up to four parallel DPCs on four different CPUs.

For example, if you have a four processor server that interrupts all processors, without RSS the DPC jumps from CPU to CPU, but it only runs on 1 CPU at a time. Each processor is only busy 25 percent of the time. The total reported CPU usage of the system is about 25 percent (perhaps more if other applications are also using the CPU). This is a sign that RSS may help performance. If the same four processor server uses RSS, there are four parallel executing DPCs; one on each processor. The total CPU available for networking processing is increased from 25 percent to 100 percent.

Some server machines and some network traffic profiles do not benefit from RSS. Since the non-offloaded TCP stack includes a data copy during receive processing, it is possible that memory bandwidth limits performance before the CPU. In this situation, the CPU usage is very high while all processors wait for memory accesses. To overcome this problem, you may reduce the number of RSS CPUs, or disable it entirely.

Poor RSS behavior is only typical of network performance testing applications that receive data, but perform no other processing. For other applications, RSS allows the application to scale other processing tasks across all CPUs and improves overall performance. RSS offers the most benefit for applications that create numerous, short lived connections. These applications are typically CPU limited, instead of network bandwidth limited.

For information on modifying the RSS Queues parameter, see “Modifying Advanced Properties” on page 34.

Note: Microsoft currently does not schedule RSS processing on all hyperthreaded CPUs. For example, only CPU 1 and 3 have RSS queues on a dual-core, hyperthreaded CPU. In contrast, a quad-core CPU has RSS queues on all 4 cores. The current Microsoft RSS model requires 4 consecutive CPUs for RSS queues, so a hyperthreaded system never uses all 4 RSS queues.

Enabling Windows to Use Up to Eight Processors

Windows Server 2003 and Server 2008 by default use only four processors. It is possible for OneConnect UCNAs to use up to eight processors. In order for the OneConnect driver to use up to eight processors, the registry must be changed and the system restarted.

For Windows Server 2003, set the registry keyword MaxNumRssCpus (a DWORD type) to eight (8) at the location:

```
HKEY_LOCAL_MACHINE\\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters
```

For Windows Server 2008, set the registry keyword MaxNumRssCpus (a DWORD type) to eight (8) at the location:

```
HKEY_LOCAL_MACHINE\\SYSTEM\CurrentControlSet\Services\Ndis\Parameters
```

Do not set the registry keyword to a value greater than the number of processors in the system or 8, whichever is smaller.

For more detailed information, refer the website http://msdn.microsoft.com/en-us/library/bb734079.aspx.

TCP Offloading

TCP Offload is supported by Windows Server. To monitor TCP offloads, in a command window type:

```
netstat -t
```

By using this command, this program indicates the offload state for each TCP connection of the system.

Note: Packet sniffing applications such as Ethereal or Microsoft Network Monitor, do not see TCP offloaded packets.

Windows Server 2008 allows TCP offloads in more scenarios than Windows Server 2003. In particular, TCP offloads may occur with the Windows Firewall enabled.

The following table lists common reasons why TCP offloads do not occur and their suggested fixes.

Table 8: Windows Server 2008 and No TCP Offloads

Reasons for No TCP Offload	Solutions

Chimney is disabled on the system.	**For Windows Server 2008**
	To determine if Chimney is enabled or disabled, use:
	netsh interface tcp show global
	`To enable Chimney, use:`
	`netsh interface tcp set global chimney=enabled`
	To disable Chimney, use:
	`netsh interface tcp set global chimney=disabled`
	
	For Windows Server 2003
	Verify if Windows Server 2003 Service Pack 2 is installed.
	3. You cannot query if TCP Chimney is enabled or disabled by using netsh. Another way to do this is to use the following command (all on one line):
	`reg query HKLM\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters /v EnableTCPChimney`
	To enable TCP Chimney offload on Windows Server 2003, use:
	`netsh in tip set chimney enabled`
	
	For Windows Server 2003 and Windows Server 2008
	To verify if offloading is enabled, use:
	`netstat -nt`
	`This command displays a list of connections and their offloading state.`

Offloads are disabled for specific ports or applications with netsh.	Use the following commands to view any TCP ports or applications that may be configured to disable TCP offload:
	`netsh interface tcp show chimneyports`
	`netsh interface tcp show chimneyapplications`

A third-party firewall is running.	Windows Firewall does not affect TCP offload, but third-party firewalls may prevent TCP offloads. Uninstall third-party firewall software to allow TCP offloads.
In the network properties, some intermediate drivers prevent offloading.	Go to **Network Connections > Properties**, and clear boxes for unused drivers. In particular, "Network Load Balancing" and some third party drivers prevent offloads.
Processor >% Processor Time	If CPU usage is high, try to enable all available offloads, such as TCP Offload, Checksum Offloads, and use Jumbo Packets.
IPSec is enabled.	Disable IPSec to use TCP offloading.
IP Network Address Translation is enabled.	Disable IP Network Address Translation.
OneConnect driver supports an Advanced Property to disable TCP offloading.	Make sure TCP offloading is enabled.
The TCP connection is using IPv6.	OneConnect driver only supports offloading TCP connections with IPv4.

Windows Networking Features and TOE

Note: Although TOE is supported, it is turned off by default.

If certain Windows Server 2003 and Windows Server 2008 networking features are enabled, TOE does not operate as expected, and connections are not offloaded.

Installing or activating firewall applications causes no connections to be offloaded by the Windows Server 2003 and Windows Server 2008 network stack. By default, Windows Firewall Services is enabled at operating system installation time, and must be explicitly disabled in order to use TOE. Firewall services may be disabled through the Service Control panel, or with the following commands at the command line prompt:

- To set firewall services to load on demand (manual), use:

  ```
  sc config MpsSvc start= demand <enter>
  ```

- To stop firewall services, use:

  ```
  Net stop MpsSvc <enter>
  ```

  or to temporarily disable firewall services, use:

  ```
  netsh advfirewall set all state off <enter>
  ```

Enabling certain Windows Networking features, such as Network Bridging, VPN and Routing may cause the operating system to enable IP Network Address Translation services and the IPSEC policy agent. These services, if enabled, disallow connections from being offloaded to the OneConnect UCNA. To disable these functions, use the Services Control panel, or the following commands at the command line prompt:

```
net stop accesspolicy <enter>
net stop sharedaccess <enter>
net stop ipnat <enter>
```

TCP Offload Performance

The OneConnect UCNA and drivers support TCP offload, which provides significant performance improvements. The performance improvements are:

- A zero copy receive data path exists. In contrast, all non-offloaded TCP packets are copied in the network stack. This copy dramatically increases the memory bandwidth and CPU requirements for receive data.
- Sending and receiving of ACK packets is handled entirely in hardware, reducing PCI-Express bus usage and interrupts.
- TCP timers are implemented in hardware, including delayed ACK, push, retransmit, keep alive, etc. This reduces host CPU usage.
- Retransmits are handled entirely in hardware.
- Packetizing data, including segmenting, checksums, and CRC. The network driver can receive huge send and receive buffers (>1MB) for maximum efficiency.
- OneConnect drivers provide efficient parallel processing of multiple connections TCP on multiple CPU systems.

The OneConnect UCNA receive path is zero copy for applications that prepost receive buffers, or issue a socket read before the data arrives. Ideal applications use Microsoft's Winsock2 Asynchronous Sockets API, which allows posting multiple receive buffers with asynchronous completions, and posting multiple send operations with asynchronous completions. Applications that do not prepost receive buffers may incur the penalty of the data copy, and the performance improvement is significantly less noticeable.

Applications that transmit large amounts of data show excellent CPU efficiency using TCP offload. TCP offload allows the network driver to accept large buffers of data to transmit. Each buffer is roughly the same amount of processing work as a single TCP packet for non-offloaded traffic. The entire process of packetizing the data, processing the incoming data acknowledgements, and potentially retransmitting any lost data is handled by the hardware.

TCP Offload Exclusions

Microsoft provides a method to exclude certain applications from being offloaded to the OneConnect UCNA. There are certain types of applications that do not benefit that much from TCP offload. These include TCP connections that are short-lived, transfer small amounts of data at a time, exhibit fragmentation from end-to-end, or make use of IP options.

If an application sends data less than the Max Segment Size (MSS), the OneConnect driver, like most TCP stacks, uses a Nagling algorithm. Nagling reduces the number of TCP packets on the network by combining small application sends into one larger TCP packet. Nagling typically reduces the performance of a single connection to allow greater overall performance for a large group of connections. During Nagling, a single connection may have long pauses (200ms) between sending subsequent packets, as the OneConnect driver waits for more data from the application to append onto the packet. An application may disable Nagling using the TCP_NO_DELAY parameter. TCP offload does not improve the performance for connections that Nagle, since the performance is intentionally limited by the Nagling algorithm. Telnet and SSH consoles are examples of connections that typically use Nagling.

Windows Server has not optimized the connection offload path. Some applications that use numerous short lived TCP connections do not show a performance improvement using TCP offload.

Windows Server provides control over the applications and TCP ports that are eligible for TCP offload using the netsh tool. Refer to the Microsoft documentation for these netsh commands:

```
netsh interface tcp add chimneyapplication state=disabled application=<path>
netsh interface tcp add chimneyport state=disabled remoteport=23 localport=*
```

Note: The netsh commands require the Windows Firewall to be running. If the Firewall is disabled, all applications and ports added with the netsh commands may fail to connect.

Windows TCP Parameters

Emulex does not recommend modifying the TCP registry parameters provided by Microsoft, such as TcpAckFrequency. The default parameters are suitable for a wide variety of situations, with or without using TCP offloading.

Support for Selective Acknowledgement in Offloaded TCP Connections

Selective Acknowledgment (SACK) is an optional TCP feature described in RFC 2018, which is supported by Windows Server and by the OneConnect driver for offloaded connections. The use of selective acknowledgments may provide a slight throughput increase in some network use cases due to a reduction of retransmission traffic. For 10 Gb/s links this is generally less than 5 percent.

SACK offload is disabled by default. To enable this support and for information on modifying the SACK parameter, see “Modifying Advanced Properties” on page 34.

Receive Window Auto Tuning and Compound TCP

Windows Server adds several features to the host TCP stack, such as receive window auto-tuning and Compound TCP (CTCP). These features only affect non-offloaded TCP traffic.

Some 10 Gb/s stress applications may actually suffer in performance with these features enabled. In particular, Emulex has seen some bi-directional data stream test performance degradation when the receive window auto-tuning is enabled. This is due to increased receive performance that adversely affects the same TCP connection's transmit performance.

To disable these features, use these commands:

```
netsh interface tcp set global autotuning=disabled
netsh interface tcp set global congestionprovider=none
```

Interrupt Coalescing

The Windows Server network driver automatically performs adaptive interrupt coalescing. During periods of low network usage, the interrupt delay is set to a minimum for lower latency. As the interrupt rate increases, the delay is increased. This allows the driver to perform more work in a single interrupt, which reduces the amount of wasted cycles from additional interrupts.

The interrupt coalescing algorithm automatically tunes the system to maintain responsiveness and performance in a wide variety of situations, including RSS and TOE traffic.

CPU Binding Considerations

Windows applications may set a processor affinity, which binds a program to a particular CPU in a multiple processor computer. However, with the recent additions to the Windows networking stack, manually configuring CPU affinity is not recommended.

The advantage of application affinity for network applications is based on choosing the ideal relationship between the DPC and application affinity to reduce processor-cache coherency cycles. The ideal mapping may require that both the DPC and application run on the same processor, different processors, or different cores of a dual core processor that share a common memory cache. Even when the best affinity relationship is determined, it is impossible to enforce this relationship since RSS or TCP offloading choose the DPC processor.

The OneConnect driver uses multiple parallel DPCs that are explicitly assigned to particular CPUs for processing both RSS and TCP offloading tasks. Each TCP connection is assigned to a particular CPU for processing. This provides the advantage of assigning CPU affinities by reducing CPU cache misses, without any user configuration. Explicit processor affinity assignments are not necessary for the OneConnect driver since the advantages of assigning processor affinities are realized by using RSS.

The only reason to experiment with application and interrupt CPU affinity is when performing isolated networking benchmarks.

Single TCP Connection Performance Settings

One common benchmark is to run a single TCP connection between two computers as fast as possible. The following are a few suggestions to deliver the best possible performance:

- Use TCP Window Scaling with a 256k or 512k window. This may be controlled with show socket applications, such as ntttcp from Microsoft.
- Use large send and receive buffers (>=128k) with an efficient application such as ntttcp.
- Disable RSS and use an interrupt filter driver as discussed in "CPU Binding Considerations". Experiment with all relative CPU affinities to find the best combination.
- Disable timestamps and SACK since the test should run without dropping any packets.
- Unbind unused network protocols in the "Network Connections" property page.
- Disable any firewall services, IPSEC, or network address translation (NAT).

Troubleshooting

There are several circumstances in which your system may operate in an unexpected manner. The Troubleshooting section contains reference tables on event codes and error messages and provides information regarding unusual situations.

Troubleshooting FC/FCoE Driver

Event Tracing (Windows Server 2003, SP1 and later only)

Trace messages are part of the Emulex lpfc log messages.

Storage Event Tracing supports two types of events:

- FFInit (0x00000001) - events that occurred at HwFindAdapter and HwInitialize.
- FFIo (0x00000002) - events that occurred during I/O.

Storage Event Tracing supports four levels of events:

- DbgLvlErr (0x00000001) - error level
- DbGLvlWrn (0x00000002) - warning level
- DbgLvlInfo (0x00000004) - Information level
- DbgLvlInfo (0x00000008) - excessive information level

Note: To view trace messages, you must enable Event Tracing in the operating system. See your Microsoft operating system documentation for more information.

Table 9: Event Tracing Summary Table

LOG Message Definition	From	To	Reserved Through	Verbose Description
ELS	0100	0130	0199	ELS events
Discovery	0202	0262	0299	Link discovery events
Mailbox	0310	0326	0399	Mailbox events
INIT	0400	0463	0499	Initialization events
FCP	0701	0749	0799	FCP traffic history events
Link	1300	1306	1399	Link events
Tag	1400	1401	1499	
NPIV	1800	1804	1800	N_Port_ID virtualization events

Event Trace Messages

ELS Log Messages (0100 - 0130)

lpfc_mes0100: 0100: FLOGI failure - ulpStatus: x%x, ulpWord[4]:x%x

DESCRIPTION: An ELS FLOGI command that was sent to the fabric failed.
SEVERITY: Error
LOG: LOG_ELS verbose
ACTION: Check fabric connection.
SEE ALSO: lpfc_mes0110.

lpfc_mes0101: 0101: FLOGI completes successfully - NPortId: x%x, RaTov: x%x, EdTov: x%x

DESCRIPTION: An ELS FLOGI command that was sent to the fabric succeeded.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0102: 0102: PLOGI completes to NPortId: x%x

DESCRIPTION: The adapter performed a PLOGI into a remote NPort.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0103: 0103:PRLI completes to NPortId: x%x, TypeMask: x%x, Fcp2Recovery: x%x

DESCRIPTION: The adapter performed a PRLI into a remote NPort.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0104: 0104: ADISC completes to NPortId x%x

DESCRIPTION: The adapter performed an ADISC into a remote NPort.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0105: 0105: LOGO completes to NPortId: x%x

DESCRIPTION: The adapter performed a LOGO into a remote NPort.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0112: 0112: ELS command: x%x, received from NPortId: x%x

DESCRIPTION: Received the specific ELS command from a remote NPort.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.
REMARKS: lpfc_mes0114 and lpfc_mes0115 are also recorded for more details if the corresponding SEVERITY level is set. You can use the XRI to match the messages.

lpfc_mes0114: 0114: PLOGI chkparm OK

DESCRIPTION: Received a PLOGI from a remote NPORT and its FC service parameters match this adapter. Request can be accepted.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.
SEE ALSO: lpfc_mes0112.

lpfc_mes0115: 0115: Unknown ELS command: x%x, received from NPortId: x%x\n

DESCRIPTION: Received an unsupported ELS command from a remote NPORT.
SEVERITY: Error
LOG: LOG_ELS verbose
ACTION: Check remote NPORT for potential problem.
SEE ALSO: lpfc_mes0112.

lpfc_mes0128: 0128: Accepted ELS command: OpCode: x%x

DESCRIPTION: Accepted ELS command from a remote NPORT.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0129: 0129: Rejected ELS command: OpCode: x%x

DESCRIPTION: Rejected ELS command from a remote NPORT.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0130: 0130: ELS command error: ulpStatus: x%x, ulpWord[4]: x%x

DESCRIPTION: ELS command failure
SEVERITY: Error
LOG: LOG_ELS verbose
ACTION: Check remote NPORT for potential problem.

Discovery Log Messages (0202 - 0262)

lpfc_mes0202: 0202: Start Discovery: Link Down Timeout: x%x, initial PLOGICount:%d

DESCRIPTION: Device discovery/rediscovery after FLOGI, FAN or RSCN has started. TMO is the current value of the soft link time. It is used for link discovery against the LinkDownTime set in parameters. DISC CNT is number of nodes being discovered for link discovery. RSCN CNT is number of nodes being discovered for RSCN discovery. There will be value in either DISC CNT or RSCN CNT depending which discovery is being performed.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0204: 0204: Discovered SCSI Target: WWN word 0: x%x, WWN word 1: x%x, DID: x%x:, RPI: x%x

DESCRIPTION: Device discovery found SCSI target.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0214: 0214: RSCN received: Word count:%d

DESCRIPTION: Received RSCN from fabric.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0215: 0215: RSCN processed: DID: x%x

DESCRIPTION: Processed RSCN from fabric.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0225: 0225: Device Discovery completes

DESCRIPTION: This indicates successful completion of device (re)discovery after a link up.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0229: 0229: Assign SCSIId x%x to WWN word 0: x%x, WWN word 1: x%x, NPortId x%x

DESCRIPTION: The driver assigned a SCSI ID to a discovered mapped FCP target. BindType - 0: DID 1:WWNN 2:WWPN
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

lpfc_mes0230: 0230: Cannot assign SCSIId to WWN word 0: x%x, WWN word 1: x%x, NPortId x%x

DESCRIPTION: SCSI ID assignment failed for discovered target.
SEVERITY: Warning
LOG: LOG_ELS verbose
ACTION: Review system configuration.

lpfc_mes0232: 0232: Continue discovery at sequence number%d, PLOGIs remaining:%d

DESCRIPTION: NPort discovery sequence continuation.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0235: 0235: New RSCN being deferred due to RSCN in process

DESCRIPTION: An RSCN was received while processing a previous RSCN.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0236: 0236: Issuing command to name server" type: x%x

DESCRIPTION: The driver is issuing a nameserver request to the fabric. Also recorded if a GID_FT is sent.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.
SEE ALSO: lpfc_mes0239 or lpfc_mes0240.

lpfc_mes0238: 0238: NameServer response DID count:%d

DESCRIPTION: Received a response from fabric name server with N DIDs.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0239: 0239: NameServer Response: next DID value: x%x

DESCRIPTION: The driver received a nameserver response. And, this message is recorded for each DID included in the response data.
SEVERITY: Information
LOG: LOG_DISCOVERY verbose
ACTION: No action needed, informational.

SEE ALSO: lpfc_mes0236.

lpfc_mes0240: 0240: NameServer Response Error - CmdRsp:x%x, ReasonCode: x%x, Explanation x%x

DESCRIPTION: The driver received a nameserver response containing a status error.
SEVERITY: Error
LOG: LOG_DISCOVERY verbose
ACTION: Check Fabric configuration. The driver recovers from this and continues with device discovery.
SEE ALSO: lpfc_mes0236.

lpfc_mes0256: 0256: Start node timer on NPortId: x%x, timeout value:%d

DESCRIPTION: Starting timer for disconnected target with NPort ID and timeout value.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0260: 0260: Stop node timer on NPortId: x%x, SCSIId: x%x

DESCRIPTION: Discontinuing timer for reconnected target with NPort ID and SCSI ID.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0262: 0262: Node timeout on NPortId: x%x, SCSIId: x%x

DESCRIPTION: Disconnected NPort ID, SCSI ID has failed to reconnect within timeout limit.
SEVERITY: Error
LOG: LOG_ELS verbose
ACTION: Review system configuration.

Mailbox Log Messages (0310 - 0326)

lpfc_mes0310: 0310: Mailbox command timeout - HBA unresponsive

DESCRIPTION: A Mailbox command was posted to the adapter and did not complete within 30 seconds. sync - 0: asynchronous mailbox command is issued 1: synchronous mailbox command is issued.
SEVERITY: Error
LOG: LOG_MBOX verbose
ACTION: This error could indicate a software driver or firmware problem. If no I/O is going through the adapter, reboot the system. If these problems persist, report these errors to Technical Support.

lpfc_mes0326: 0326: Reset HBA - HostStatus: x%x

DESCRIPTION: The adapter has been reset.
SEVERITY: Information
LOG: LOG_MBOX verbose
ACTION: No action needed, informational.

INIT Log Messages (0400 - 0463)

lpfc_mes0400: 0400 Initializing discovery module: OptionFlags: x%x

DESCRIPTION: Driver discovery process is being initialized with internal flags as shown.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0401: 0401: Initializing SLI module: DeviceId: x%x, NumMSI:%d

DESCRIPTION: PCI function with device id and MSI count as shown is being initialized for service level interface.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0405: Service Level Interface (SLI) 2 selected\n");

DESCRIPTION: Service Level Interface level 2 is selected.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0406: 0406: Service Level Interface (SLI) 3 selected\n");

DESCRIPTION: Service Level Interface level 3 is selected.
SEVERITY: Information
LOG: LOG_ELS verbose
ACTION: No action needed, informational.

lpfc_mes0436: Adapter not ready: hostStatus: x%x

DESCRIPTION: The adapter failed during powerup diagnostics after it was reset.
SEVERITY: Error
LOG: LOG_INIT verbose
ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc_mes0442: 0442: Adapter failed to init, CONFIG_PORT, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing CONFIG_PORT mailbox command.
SEVERITY: Error
LOG: LOG_INIT verbose
ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc_mes0446: 0446: Adapter failed to init, CONFIG_RING, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing CFG_RING mailbox command.
SEVERITY:
LOG: LOG_INIT verbose
ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc_mes0454: 0454: Adapter failed to init, INIT_LINK, mbxStatus x%x

DESCRIPTION: Adapter initialization failed when issuing INIT_LINK mailbox command.
SEVERITY: Error
LOG: LOG_INIT verbose
ACTION: This error could indicate a hardware or firmware problem. If problems persist report these errors to Technical Support.

lpfc_mes0458: 0458: Bring Adapter online

DESCRIPTION: The FC driver has received a request to bring the adapter online. This may occur when running HBAnyware.
SEVERITY: Warning
LOG: LOG_INIT verbose
ACTION: None required.

lpfc_mes0460: 0460: Bring Adapter offline

DESCRIPTION: The FC driver has received a request to bring the adapter offline. This may occur when running HBAnyware.
SEVERITY: Warning
LOG: LOG_INIT verbose
ACTION: None required.

lpfc_mes0463: 0463: Adapter firmware error: hostStatus: x%x, Info1(0xA8): x%x, Info2 (0xAC): x%x

DESCRIPTION: The firmware has interrupted the host with a firmware trap error.
SEVERITY: Error
LOG: LOG_INIT verbose
ACTION: Review HBAnyware diagnostic dump information.

FCP Log Messages (0701 - 0749)

lpfc_mes0701: 0701: Issue Abort Task Set to PathId: x%x, TargetId: x%x, Lun: x%x

DESCRIPTION: The driver has issued a task management command for the indicated SCSI device address.
SEVERITY: Warning
LOG: LOG_INIT verbose
ACTION: Review system configuration.

lpfc_mes0703: 0703: Issue LUN reset to PathId: x%x, TargetId: x%x, Lun: x%x, Did: x%x

DESCRIPTION: Storport is requesting a reset of the indicated LUN.
SEVERITY: Warning
LOG: LOG_INIT verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.

lpfc_mes0713: 0713: Issued Target Reset to PathId:%d, TargetId:%d, Did: x%x

DESCRIPTION: Storport detected that it needs to abort all I/O to a specific target. This results in login reset to the target in question.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.
SEE ALSO: lpfc_mes0714.

lpfc_mes0714: 0714: Issued Bus Reset for PathId:%d

DESCRIPTION: Storport is requesting the driver to reset all targets on this adapter.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.
SEE ALSO: lpfc_mes0713.

lpfc_mes0716: 0716: FCP Read Underrun, expected%d, residual%d

DESCRIPTION: FCP device provided less data than was requested.
SEVERITY: Supplement Information
LOG: LOG_FCP verbose
ACTION: No action needed, informational.
SEE ALSO: lpfc_mes0730.

lpfc_mes0729: 0729: FCP command error: ulpStatus: x%x, ulpWord[4]: x%x, XRI: x%x, ulpWord[7]: x%x

DESCRIPTION: The specified device failed an I/O FCP command.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Check the state of the target in question.
REMARKS: lpfc_mes0730 is also recorded if it is a FCP Rsp error.

lpfc_mes0730: 0730: FCP response error: Flags: x%x, SCSI status: x%x, Residual:%d

DESCRIPTION: The FCP command failed with a response error.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Check the state of the target in question.
remark: lpfc_mes0716, lpfc_mes0734, lpfc_mes0736 or lpfc_mes0737 is also recorded for more details if the corresponding SEVERITY level is set.
SEE ALSO: lpfc_mes0729.

lpfc_mes0734: 0734: Read Check: fcp_parm: x%x, Residual x%x

DESCRIPTION: The issued FCP command returned a Read Check Error.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Check the state of the target in question.
SEE ALSO: lpfc_mes0730.

lpfc_mes0737: 0737: SCSI check condition, SenseKey x%x, ASC x%x, ASCQ x%x, SrbStatus: x%x

DESCRIPTION: The issued FCP command resulted in a Check Condition.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review SCSI error code values.
SEE ALSO: lpfc_mes0730.

0747: Target reset complete: PathId: x%x, TargetId: x%x, Did: x%x

DESCRIPTION: A target reset operation has completed.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.
REMARK: See also Message 0713.

0748: Lun reset complete: PathId: x%x, TargetId: x%x, Lun: x%x

DESCRIPTION: A LUN reset operation has completed.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.
REMARK: See also Message 0703.

0749: Abort task set complete: Did: x%x, SCSIId: x%x

DESCRIPTION: A task management has completed.
SEVERITY: Warning
LOG: LOG_FCP verbose
ACTION: Review system configuration. Possible side-effect of cluster operations.
REMARK: See also Message 0701.

Link Log Messages (1302 - 1306)

lpfc_mes1302: 1302: Invalid speed for this board:%d, forced link speed to auto

DESCRIPTION: The driver is re-initializing the link speed to auto-detect.
SEVERITY: Warning
LOG: LOG_LINK_EVENT verbose
ACTION: None required.

lpfc_mes1303: 1303: Link Up event: tag: x%x, link speed:%dG, topology (0 = Pt2Pt, 1 = AL):%d

DESCRIPTION: A link up event was received. It is also possible for multiple link events to be received together.
SEVERITY: Error
LOG: LOG_LINK_EVENT verbose
ACTION: If numerous link events are occurring, check physical connections to the FC network.
REMARKS: lpfc_mes1304 is recorded if Map Entries > 0 and the corresponding mode and SEVERITY level is set.

lpfc_mes1305:1305: Link down even: tag x%x

DESCRIPTION: A link down event was received.
SEVERITY: Error
LOG: LOG_LINK_EVENT verbose
ACTION: If numerous link events are occurring, check physical connections to the FC network.

lpfc_mes1306: 1306: Link Down timeout

DESCRIPTION: The link was down for greater than the configuration parameter (HLinkTimeOut) seconds. All I/O associated with the devices on this link will be failed.
SEVERITY: Warning
LOG: LOG_LINK_EVENT verbose
ACTION: Check adapter cable/connection to SAN.

Tag Messages (1400 - 1401)

lpfc_mes1400 1400: Tag out of range: ContextIndex: x%x, MaxIndex: x%x, ulpCommand: x%x

DESCRIPTION: Firmware has generated an invalid response.
SEVERITY: Error
LOG: LOG_LINK_EVENT verbose
ACTION: Review hardware configuration. Contact Emulex Technical Support.

lpfc_mes1401 1401: Invalid tag: ContextIndex: x%x, ulpCommand: x%x

DESCRIPTION: Firmware has generated an invalid response.
SEVERITY: Error
LOG: LOG_LINK_EVENT verbose
ACTION: Review hardware configuration. Contact Emulex Technical Support.

NPIV Messages (1800 - 1899)

lpfc_mes1800 1800: NPIV FDISC failure VPI: x%x Error x%x Reason x%x

DESCRIPTION: Virtual Port fails on a FDISC to the switch with the error and reason listed.
SEVERITY: Error
LOG: LOG_NPIV verbose
ACTION: Check to ensure the switch supports NPIV.

lpfc_mes1801 1801: Memory allocation failure for NPIV port: x%x

DESCRIPTION: Fails to allocated the block of memory for the Virtual Port.
SEVERITY: Error
LOG: LOG_NPIV verbose
ACTION: Check to ensure system has sufficient kernel memory.

lpfc_mes1802 1802: Exceeded the MAX NPIV port: x%x

DESCRIPTION: Exceeded the number of Virtual Port allows on the adapter.
SEVERITY: Error
LOG: LOG_NPIV verbose
ACTION: Reduce the number of Virtual Ports.

lpfc_mes1803 1803: Virtual Port: x%x VPI:x%x successfully created.

DESCRIPTION: Virtual Port ID is successfully created.
SEVERITY: Information
LOG: LOG_NPIV verbose
ACTION: No action needed, informational.

lpfc_mes1804 1804: Removing Virtual Port: x%x VPI:x%x

DESCRIPTION: Removing Virtual Port ID.
SEVERITY: Information
LOG: LOG_NPIV verbose
ACTION: No action needed, informational.

ELS Messages (1900 - 1999)

1900: x%x sends ELS_AUTH_CMD x%x with TID x%x

DESCRIPTION: An ELS_AUTH_CMD is sent.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

1901: x%x sends ELS_AUTH_REJECT x%x x%x to x%x

DESCRIPTION: An ELS_AUTH_REJECT is sent.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

1902: Receives x%x from x%x in state x%x

DESCRIPTION: Receives an ELS_AUTH_CMD.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

1903: Receives ELS_AUTH_RJT x%x x%x

DESCRIPTION: Receives an ELS_AUTH_REJECT.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

1904: Authentication ends for x%x with status x%x (%d %d)

DESCRIPTION: Authentication is done.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

1905: Authentication policy change for local x%08x x%08x remote x%08x%08x

DESCRIPTION: Authentication policy has been changed.
SEVERITY: Information
LOG: LOG_FCSP verbose
ACTION: No action needed, informational.

Troubleshooting NIC and ISCSI Drivers

Windows Server NIC

The following table provides troubleshooting information for the NIC OneConnect adapter.

Table 10: Windows Server NIC

Problem	Answer/Solution
The operating system fails to install or does not successfully install the NIC drivers.	Verify that the operating system is supported by OneConnect driver.
The firmware fails to flash.	Use the CD-ROM ISO image located on installation CD2 to flash the firmware.
Windows Device Manager displays code 10 or code 39 with a yellow or red bang on the device.	The flash image does not match the installed device drivers, or the flash has become corrupted. Reflash the OneConnect UCNA and try again.

Table 10: Windows Server NIC (Continued)

Problem	Answer/Solution
The firmware is corrupted or non-responsive.	Update the firmware with the Flash utility. To update the firmware: 1. Locate the ISO image file on the installation CD2 and create a bootable CD. 2. Boot to the CD on a OneConnect UCNA installed system. 3. Press **<Y>** when prompted if you want to continue to update to the firmware version. The firmware automatically updates. 4. Remove the flash CD from the CD drive. 5. Reboot and verify that the BIOS banner shows the updated version.

Windows Server iSCSI

The following table provides Windows Server iSCSI troubleshooting information for the OneConnect UCNA.

Table 11: Windows Server iSCSI

Problem	Answer/Solution
Overall failure.	Use the iSCSISelect utility to clear the Adapter Configuration. To do this: 1. From the Adapter menu select **Clear Configuration**, then press **<Enter>**. 2. A message will appear asking if you want to clear the current configuration. Press **<Y>**. 3. You will be cautioned that the operation will remove any existing configuration permanently. Press **<Y>**. After you clear the Adapter Configuration, reboot the system and then reconfigure the OneConnect UCNA.
The iSCSI boot install fails.	• Verify the Boot target/LUN connectivity in iSCSISelect utility. • Check the system BIOS for boot device priority order.

Windows Server NIC/TOE

The following table provides Windows Server NIC/TOE troubleshooting information for the OneConnect UCNA.

Table 12: Windows Server NIC/TOE

Problem	Answer/Solution
Performance is not as expected.	If TOE is enabled and performance is not as high as expected, the operating system may not offload TOE connections. For more information, see “Windows Server NIC/TOE Driver Parameters” on page 34.
There are frequent event log entries for link changes, or statistics that show more than expected CRC errors.	There may not be enough memory installed in the system to provide sufficient memory for all devices installed in the system. Try installing more memory if possible.

Problem	Answer/Solution
The driver fails to load and an event log entry states that the driver failed to load due to memory constraints.	Unload and reload the driver to reset available target IDs. Ensure that the SAN configuration is correct prior to reloading the driver. This clears the driver's consistent binding table and frees target IDs for new target nodes.

Troubleshooting Cisco Nexus Switch Configuration

Table 13: Cisco Nexus Switch Situations

Problem	Solution
1. Windows creates the NTFS partition ok, but then reports that "The hard disk containing the partition or free space you chose has a LUN greater than 0. Setup cannot continue". (Dell 1850 server). 2. Windows reboots successfully, but then gets stuck during the GUI portion of the installation right from the beginning. (HP DL385G2 server).	Set up the FCoE switch ports as follows: no priority-flow-control mode on untagged cos 0 flowcontrol receive on flowcontrol send on spanning-tree port type edge

Appendix A Error/Event Log Information

FC/FCOE Error/Event Logging

FC/FCOE Error Log

Viewing the Error Log

The system event log is a standard feature of Windows Server 2003. All events logged by the Emulex Storport Miniport will be Event ID 11 with source “elxstor”.

To view the error LOG:

1. Open the Event Viewer window:
   - Click **Start>Programs>Administrative Tools>Event Viewer**

     or
   - Right-click on **My Computer**, **Manage** and **Event Viewer** in **Computer Management**.

   The Event Viewer window is displayed.
2. Double-click any event with the source name ELXSTOR.
3. Examine the entry at offset 0x10 and Event ID 11. The Emulex event code is found in byte 0010 and supplementary data is in the byte offsets 0011 through 0013 (in example Figure 4, byte 0010 = 9b, byte 0011 = 00, byte 0012 = 29 and byte 0013 = 00).

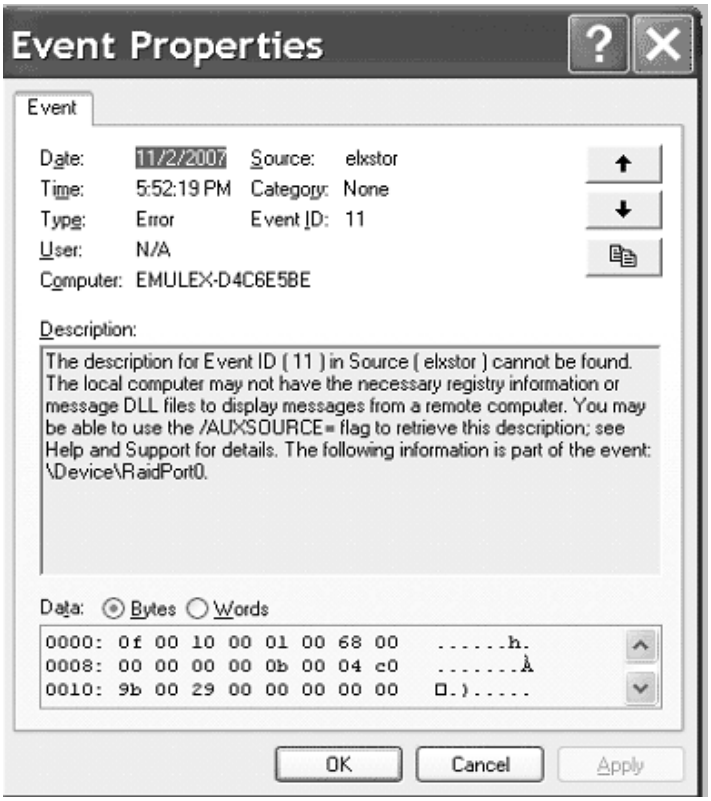
Event Properties
Event
Date: 11/2/2007
Source: elxstor
Time: 5:52:19 PM
Category: None
Type: Error
Event ID: 11
User: N/A
Computer: EMULEX-D4C6E5BE
Description:
The description for Event ID (11) in Source (elxstor) cannot be found. The local computer may not have the necessary registry information or message DLL files to display messages from a remote computer. You may be able to use the /AUXSOURCE= flag to retrieve this description; see Help and Support for details. The following information is part of the event: \Device\RaidPort0.
Data: Bytes Words
0000: 0f 00 10 00 01 00 68 00 ......h.
0008: 00 00 00 00 0b 00 04 c0 ....À
0010: 9b 00 29 00 00 00 00 00 □.).....
OK
Cancel
Apply

Figure 4: Event Properties

Severity Scheme

When the Event Viewer is launched, there are three branches: Application, Security and System. All ELXSTOR error log entries are found under the System branch and all ELXSTOR error log entries have the Event Viewer severity level of “error”.

- A severe error code indicates that the driver, firmware or adapter is behaving abnormally and your intervention is required to correct the problem.
- A malfunction error code indicates that there is a problem with the system, but your intervention is not required.
- A command error code indicates that an event has transpired, but does not require your intervention. An event may be problem-oriented, such as an invalid fabric command sub-type. An event may not be problem-oriented, such as exhausted retries on PLOGI or PDISC.

Related Driver Parameter: LogError

The LogError driver parameter determines the minimum severity level to enable entry of a logged error into the system.

- If set to 0 = all errors regardless of severity are logged.
- If set to 1 = severe, malfunction and command level errors are logged.
- If set to 2 = both severe and malfunction errors are logged.
- If set to 3 = only severe errors are logged.

Note: See the Configuration Section for instructions on how to set driver parameters.

Note: Set LogError to 1 if you are troubleshooting SAN connectivity or device discovery issues.

Format of an Error Log Entry

An error log entry will take the form of an event.This event is described by:

- Date (date entry was logged)
- Source (elxstor)
- Time (time entry was logged)
- Category (none)
- Type (error)
- Event id (0)
- User (N/A)
- Computer (name of computer)

Error Codes Tables

Table 14: Severe Errors

Bits 0 - 7	Interpretation
0x00	Invalid link speed selection (SLI2-3 mode)
0x01	READ_REV failed (SLI2-3 mode)
0x02	Invalid adapter type (Lightpulse)
0x03	Invalid adapter type (Lightpulse)
0x04	CONFIG_PORT failed
0x06	READ_CONFIG_failed
0x07	CONFIG_RING 0 failed
0x09	CONFIG_RING 1 failed
0x08	CONFIG_RING 2 failed
0x0A	CONFIG_RING 3 failed
0x0B	INIT_LINK failed (SLI2-3 mode)
0x0C	INIT_LINK failed (SLI2-3 mode)
0x0D	READ_REV failed (SLI2-3 mode)
0x0E	Invalid adapter type (Lightpulse)
0x0F	Invalid adapter type (Lightpulse)
0x10	CONFIG_PORT failed (reinitialization)
0x12	READ_CONFIG command failed (reinitialization)
0x13	CONFIG_RING 0 failed (reinitialization)
0x14	CONFIG_RING 1 failed (reinitialization)
0x15	CONFIG_RING 2 failed (reinitialization)
0x16	CONFIG_RING 3 failed (reinitialization)
0x17	Unresponsive adapter port (SLI2-3 mode)
0x1C	Firmware trap: info1 (SLI2-3 mode)
0x1D	Firmware trap: info2 (SLI2-3 mode)
0x1E	Over-temperature error condition (Lightpulse)
0x1F	Firmware-initiated adapter port reset (Lightpulse)
0x20	Adapter port error attention (Lightpulse)
0x22	Over-temperature warning (Lightpulse)
0x23	Returned to safe temperature (Lightpulse)
0x24	Invalid response tag (SLI2-3 mode)
0x25	Invalid response tag (SLI2-3 mode)
0x26	Invalid response tag (SLI2-3 mode)
0x27	Invalid response sequence (SLI2-3 mode)
0x28	Failure on REG_LOGIN mailbox command
0x29	Unable to initiate fabric binding operation
0x2A	Attempted ADISC to non-existent node
0x2B	Failure on iocb context allocation
0x2C	Unable to initiate nport unbinding operation
0x2D	Unable to initiate nport binding operation
0x30	Failure on mailbox context allocation
0x7C	Menlo initialization error
0x7D	Menlo initialization error
0x7E	Menlo initialization error
0xA0	Failed to initialize adapter port (OneConnect)
0xA1	Failed to initialize adapter port (Lightpulse)
0xC0	Insufficient revision level for STORPORT.SYS
0xC1	Failed to allocate miniport un-cached extension
0xC2	Insufficient un-cached extension space
0xC3	Port initialization failure (OneConnect)

Table 14: Severe Errors

Bits 0 - 7	Interpretation
0xC4	Port initialization failure (Lightpulse)
0xC5	Utility mailbox command error
0xC6	SLI4 Pre-initialization failure
0xD3	NPIV memory allocation failure
0xF0	Unresponsive adapter port (SLI4 mode)
0xF4	ULP Unrecoverable Error: low part (SLI4 mode)
0xF5	ULP Unrecoverable Error: high part (SLI4 mode)
0xF6	ARM Unrecoverable Error (SLI4 mode)
0xF7	READ_NV failed (SLI4 mode)
0xF8	READ_NV failed (SLI4 mode)
0xF9	READ_REV failed (SLI4 mode)
0xFA	READ_CONFIG failed (SLI4 mode)
0xFB	Failed to post header templates (SLI4 mode)
0xFC	Invalid Completion Queue Entry (SLI4 mode)
0xFD	Invalid Completion Queue Entry (SLI4 mode)
0xFE	Invalid Completion Queue Entry (SLI4 mode)

Table 15: Malfunction Errors

Bits 0 - 7	Interpretation
0x05	SET_VAR command failed
0x11	SET_VAR command failed (reinitialization)
0x21	Spurious mailbox command interrupt
0x31	Unrecognized mailbox command completion
0x32	Duplicate link attention: event tag unchanged
0x33	Invalid link attention: no link state indicated
0x34	Duplicate link attention: link state unchanged
0x35	Error reading common service parameters for port
0x36	Error reading common service parameters for fabric
0x37	Error reading common service parameters for nport
0x3B	Failed to create node object
0x3C	PRLI initiation failure
0x42	Exhausted retries on FLOGI
0x45	ELS command rejected
0x49	Exhausted retries on PLOGI
0x4E	World Wide Port Name mismatch on ADISC
0x4F	World Wide Node Name mismatch on ADISC
0x50	ADISC response failure
0x55	LOGO response failure
0x57	PRLI to non-existent node
0x5A	PRLI response error
0x5F	CT command error
0x62	Name server response error
0x66	State Change Notification registration failure
0x6A	Unrecognized ELS command received
0x6F	Received PRLI from un-typed source
0x73	Failed to pend PRLI for authentication
0x77	Failed to allocate Node object
0x7A	REG_VPI failed
0xA3	Command context allocation failure
0xAB	SCSI command error

Table 15: Malfunction Errors (Continued)

Bits 0 - 7	Interpretation
0xAC	Read check error
0xB0	Node timeout: device removal signaled to Storport

Table 16: Command Errors

Bits 0 - 7	Interpretation
0x43	Fabric login succeeded
0x46	ELS command failed
0x47	Exhausted retries on ELS command
0x4A	PLOGI accepted
0x56	LOGO accepted
0x59	PRLI accepted
0x63	Fabric name server response
0x6B	ELS RSCN processed
0x71	LOGO received from fabric
0x79	FDISC accepted
0xA2	SCSI address assigned to discovered target
0xA4	Report LUNs error (initial I/O to discovered target)
0xA5	Local error indication on FCP command
0xA8	Data overrun
0xA9	FCP command error
0xAA	SCSI check condition
0xAD	Local reject indication on FCP command
0xAE	Error on SCSI pass-through command
0xAF	Error on Menlo CT command

Table 17: Event Indications

Bits 0 - 7	Interpretation
0x18	Port shutdown event (Lightpulse)
0x19	Port in off-line state (Lightpulse)
0x1A	Port in on-line state (Lightpulse)
0x1B	Port in off-line state (Lightpulse)
0xA7	Data underrun
0xD0	NPIV Virtual Port creation success (Virtual Port Did in bits 8-31)
0xD1	NPIV Virtual Port creation failed (Virtual Port index in bits 8-31)
0xD2	NPIV Virtual Port FDISC failed (Virtual Port index in bits 8-31)
0xD4	Exceeded max Virtual Port supported (Virtual Port index in bits 8-31)
0xD5	NPIV Virtual Port removal (Virtual Port Did in bits 8-31)
0xE0	Authenticated successfully (remote Did in bits 8-31)
0xE1	Failed to authenticate (remote Did in bits 8-31)
0xE2	Authentication not support (remote Did in bits 8-31)
0xE3	Authentication ELS command timeout (remote Did in bits 8-31)
0xE4	Authentication transaction timeout (remote Did in bits 8-31)
0xE5	LS_RJT other than Logical Busy received for Authentication transaction (remote Did in bits 8-31)
0xE6	LS_RJT Logical Busy received for Authentication Transaction (remote Did in bits 8-31)
0xE7	Received Authentication Reject other than Restart (remote Did in bits 8-31)
0xE8	Received Authentication Reject Restart (remote Did in bits 8-31)
0xE9	Received Authentication Negotiate (remote Did in bits 8-31)

Table 17: Event Indications (Continued)

Bits 0 - 7	Interpretation
0x18	Port shutdown event (Lightpulse)
0xEA	Authentication spurious traffic (remote Did in bits 8-31)
0xEB	Authentication policy has been changed (remote Did in bits 8-31)
0xED	Same passed were set for both local and remote entities (remote Did in bits 8-31)
0xF1	Port shutdown event (OneConnect)
0xF2	Port in off-line state (OneConnect)
0xF3	Port in on-line state (OneConnect)

FC/FCOE Event Log

The following information is designed to provide additional information that you might find useful in assisting your customers.

Event Log Interpretation

- All events logged by Emulex Storport Miniport are in Event ID 11 with source "elxstor".
- The Storport Miniport driver parameter LogErrors determines what type of events are logged by the driver; the default setting is "3" which logs only events of a SEVERE nature; the optional setting of "2" logs events of both SEVERE and MALFUNCTION type; the optional setting of "1" logs events of SEVERE, MALFUNCTION and COMMAND type.

  Note: For troubleshooting SAN connectivity or device discovery issues, set the LogErrors to 1.

- The Emulex event code is found in byte 0010 and supplementary data is in byte offsets 0011 through 0013.

Additional Event Log Information

The following tables are not comprehensive but do include those codes, which through Emulex's experiences in our support and testing environments, we feel are most likely to show up in SAN environments where problems occur.

ELS/FCP Command Error Status Codes

Internal firmware codes posted by the adapter firmware that explain why a particular ELS or FCP command failed at the FC level.

Table 18: ELS/FCP Command Error Status Codes

Explanation	Code
Remote Stop - Remote port sent an ABTS	0x2
Local Reject - Local Reject error detail	0x3
LS_RJT Received - Remote port sent LS_RJT	0x9
A_RJT Received - Remote port sent BA_RJT	0xA

CT Command Response Codes

Codes that indicate the response to a FC Common Transport protocol command.

Table 19: CT Command Response Codes

Explanation	Code
FC Common Transport Reject	0x8001
FC Common Transport Accept	0x8002

FC-CT Reject Reason Codes

Codes that indicate the reason a CT command was rejected.

Table 20: FC-CT Reject Reason Codes

Explanation	Code
Invalid command code	0x01
Invalid version level	0x02
Logical busy	0x05
Protocol error	0x07

ELS Command Codes

FC protocol codes that describe what particular Extended Link Services command was sent.

Table 21: ELS Command Codes

Explanation	Code
Link Service Reject (LS_RJT)	0x01
Accept (ACC)	0x02
N_Port Login (PLOGI)	0x03
Fabric Login (FLOGI	0x04
N_Port Logout (LOGO)	0x05
Process Login (PRLI)	0x20
Process Logout (PRLO)	0x21
Discover F_Port Service Params (FDISC)	0x51
Discover Address (ADISC)	0x52
Register State Change Notify (RSCN)	0x61

SCSI Status

The SCSI status returned from a SCSI device which receives a SCSI command.

Table 22: SCSI Status Codes

Explanation	Code
GOOD	0x00
CHECK CONDITION	0x02
BUSY	0x08
RESERVATION CONFLICT	0x18
QUEUE FULL	0x28

Local Reject Status

Codes supplied by the Emulex adapter firmware which indicate why a command was failed by the adapter.

Table 23: Local Reject Status Codes

Explanation	Code
SEQUENCE TIMEOUT - Possible bad cable/link noise	0x02
INVALID RPI - Occurs when link goes down	0x04
NO XRI - Possible host or SAN problem	0x05
TX_DMA FAILED - Possible host system problem	0x0D
RX_DMA FAILED- Possible host system problem	0x0E
ILLEGAL FRAME - Possible bad cable/link noise	0x0F
NO RESOURCES - Port out of exchanges or logins	0x11
LOOP OPEN FAILURE - FC_AL port not responding	0x18
LINK DOWN - Queued cmds returned at link down	0x51A
OUT OF ORDER DATA - Possible bad cable or noise	0x1D

SRB Status

SCSI Request Block status provided by the driver to the operating system based upon response from SCSI device in the SAN.

Table 24: SRB Status Codes

Explanation	Code
ERROR	0x04
BUSY	0x05
TIMEOUT	0x09
SELECTION TIMEOUT	0x0A

Table 24: SRB Status Codes (Continued)

Explanation	Code
COMMAND TIMEOUT	0x0B
BUS RESET	0x0E
DATA OVERUN	0x12

ASC/ASCQ

Additional Sense Code/Additional Sense Code Qualifier information can be found in any SCSI specification document - these codes contain detailed information about the status/condition of the SCSI device in question.

Additional Notes on Selected Error Codes

These are error codes which may be seen more frequently than others or which indicate conditions that you might be able to solve by investigation and correction of problems in the SAN configuration.

Note: Nomenclature of 0x is used as the prefix for the byte code fields since those byte codes are actually hex values.

Node timeout (code 0xAA)

This event code indicates that a particular device has not been found (if the message is logged during device discovery) or that a particular device has been removed from the fabric. If this message is seen, determine if there is something wrong with the connection of that device to the SAN (cables, switches or switch ports, status of the target device itself).

SCSI Command Error (0x9A) and SCSI Check Condition (code 0x9B)

Code 0x9A indicates that the SCSI command to a particular device was responded to with an error condition (the target and LUN information, along with the SCSI status, are provided).

In the specific case of code 0x9B, this code indicates that the device responded with the specific status of Check Condition - the ASC/ASCQ information provided in bytes 0x12 and 0x13 will allow you to find out what status is being reported by the target and see if there is some action that can be performed to return the device to functional status.

Nameserver Response (code 0x98)

This code is useful in determining if the expected number of targets in a SAN configuration are being presented by the nameserver to the requesting adapter. The number in byte 0x11 is the number of targets returned to the nameserver query made by the adapter - if the number of targets does not match expectations, examine the SAN configuration found in the switch tables and if that information shows targets or devices still missing, check connections between the switch ports and those devices.

Context Allocation Failures

There are a number of event codes for which the interpretation contains the phrase "context allocation failure" - these types of events are referring to the internal memory constructs of the Emulex Storport Miniport driver and as such are intended for Emulex design engineer's information. If a customer

encounters such an event, they should contact Emulex support for analysis and determination if that particular event may be an indicator of a failed adapter or of some problem with interaction between the adapter, the Emulex Storport Miniport driver, the host operating system and the host memory.

Note: Context allocation failures are rare.

NIC and ISCSI Error/Event Log

Retrieving Windows NIC/TOE Error Log Codes

For Windows Server operating systems, the OneConnect network driver generates error codes in the system event log. These error codes can be viewed by using the Event Viewer application.

To view the error codes:

1. Click the **Start** tab on the bottom of the screen.
2. Click **Run**.
3. Type **`eventvwr`** and click **OK**.
4. Click **Windows Log**.
5. Click **System**.
6. Click the be2net error under System Events to show the event details.

The following is an example of a Windows Server 2003 error (be2ndis6x) you would see in the system event log:

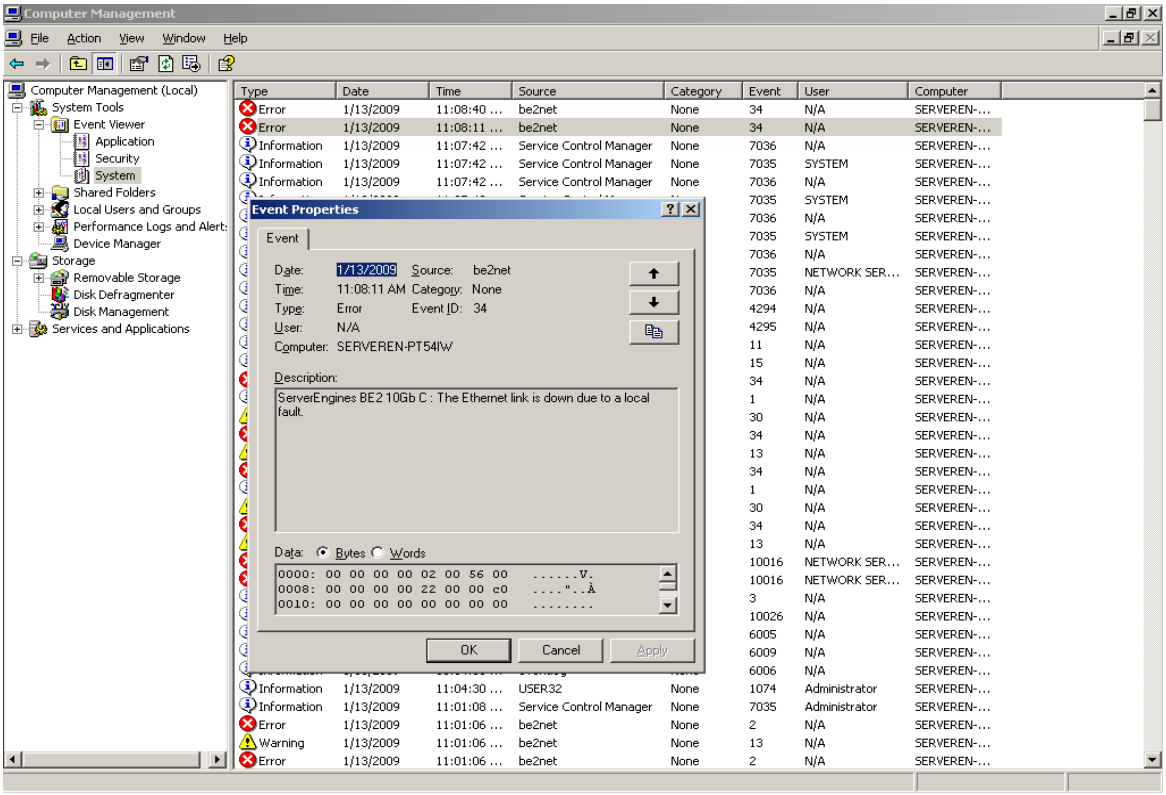
Computer Management
File Action View Window Help
Computer Management (Local)
System Tools
Event Viewer
Application
Security
System
Shared Folders
Local Users and Groups
Performance Logs and Alerts
Device Manager
Storage
Removable Storage
Disk Defragmenter
Disk Management
Services and Applications
Type Date Time Source Category Event User Computer
Error 1/13/2009 11:08:40 ... be2net None 34 N/A SERVEREN-...
Error 1/13/2009 11:08:11 ... be2net None 34 N/A SERVEREN-...
Information 1/13/2009 11:07:42 ... Service Control Manager None 7036 N/A SERVEREN-...
Information 1/13/2009 11:07:42 ... Service Control Manager None 7035 SYSTEM SERVEREN-...
Information 1/13/2009 11:07:42 ... Service Control Manager None 7036 N/A SERVEREN-...
Event Properties
Event
Date: 1/13/2009 Source: be2net
Time: 11:08:11 AM Category: None
Type: Error Event ID: 34
User: N/A
Computer: SERVEREN-PT54IW
Description:
ServerEngines BE2 10Gb C : The Ethernet link is down due to a local fault.
Data: Bytes Words
0000: 00 00 00 00 02 00 56 00 .....V.
0008: 00 00 00 00 22 00 00 c0 ....".À
0010: 00 00 00 00 00 00 00 00 ....
OK Cancel Apply
Information 1/13/2009 11:04:30 ... USER32 None 1074 Administrator SERVEREN-...
Information 1/13/2009 11:01:08 ... Service Control Manager None 7035 Administrator SERVEREN-...
Error 1/13/2009 11:01:06 ... be2net None 2 N/A SERVEREN-...
Warning 1/13/2009 11:01:06 ... be2net None 13 N/A SERVEREN-...
Error 1/13/2009 11:01:06 ... be2net None 2 N/A SERVEREN-...

Figure 5: Windows Server 2003 be2net Error

When attempting to correlate NIC/TOE error log code to event log entries, you must convert the Event ID into hexadecimal to obtain the corresponding Message ID in the event log entry. In the example (Figure 5), the NIC/TOE use of Event ID 34 must be converted to hexadecimal (0x0022) in order to reference the correct Message ID in Table 25, “NIC/TOE Event Log Entries,” on page 73. For Message ID 0x0022, the error message is “The Ethernet link is down due to a local fault,” which also matches the description in the Event Properties screen shown in Figure 5.

NIC/TOE Event Log Entries

Windows Device Manager generates error log codes if any errors occur during the installation of the NIC driver. Each log contains a Message Id, Severity and Symbolic Link. The Message Id is unique and tracks the error message (if not displayed). Table 25 shows the list of error codes, the severity of the error, the message displayed, the meaning of the error and recommended resolutions. When reporting a problem with the OneConnect UCNA to Emulex, check the event log and report any of these entries that may be present.

Table 25: NIC/TOE Event Log Entries

Message ID	Severity	Message	Recommended Resolution
0x0023	Error	`The Ethernet link is down due to a remote fault.`	This message is informational, and states that the Ethernet link is down due to the remote partner signaling a fault. Check the peer device for errors.
0x0022	Error	`The Ethernet link is down due to a local fault.`	This message is informational, and states that the Ethernet link is down due to a link down event detected at the OneConnect driver.
0x001c	Error	`Vital product data is not initialized correctly.`	Use the offline flash utility to reconfigure the device.
0x000d	Warning	`Windows 2003 Service Pack 2 is required for RSS and TCP connection offload.`	Windows Server 2003 Service Pack 2 or higher is required for Receive Side Scaling and TCP Offload features to be enabled. This warning applies only to Windows Server 2003.
0x000c	Error	`The Ethernet link is down.`	This message is informational.
0x000b	Information	`The Ethernet link is up.`	This message is informational.
0x000a	Error	`The network device detected a fatal error.`	A fatal hardware error occurred. Verify that the firmware flash image is not corrupted. Contact Emulex Technical Support.
0x0015	Warning	`Firmware version does not match driver version.`	The flash firmware version and driver must match. This is a warning message, but it is recommended that you reinstall matching versions of the firmware and driver.
0x0014	Error	`Failed to read registry configuration.`	The registry is corrupted. Reinstall the driver and/or operating system.

Table 25: NIC/TOE Event Log Entries (Continued)

Message ID	Severity	Message	Recommended Resolution
0x0013	Error	`Resource conflict.`	The operating system failed to allocate resources for the device. Check low memory conditions and operating system hardware resource conflicts.
0x0012	Error	`Failed to enable bus mastering.`	Verify that the BIOS allows bus mastering and that no resource conflicts exist.
0x0011	Error	`The driver is incompatible with the device.`	The driver is loaded on the incorrect hardware device. Verify that the correct driver is installed.
0x0010	Warning	`The network driver was reset.`	This may indicate a system hang or hardware problem. Verify other system devices are working properly.
0x0009	Error	`Failed to register interrupt service routine.`	This is an NDIS error. Verify that hardware resource conflicts do not exist.
0x0008	Error	`Failed to get TCP offload handlers.`	This is an NDIS error. Verify the NDIS version is valid for the driver.
0x0007	Warning	`A memory allocation failure occurred during driver load. Performance may be reduced.`	This warning occurred due to a failed memory allocation. Check low memory conditions. Use a smaller MTU or disable TCP offload to reduce driver memory requirements.
0x0006	Error	`Driver load failed due to memory allocation failure`	This failure occurred due to a failed memory allocation in the driver. Check low memory conditions.
0x0005	Error	`Failed to register scatter gather DMA.`	This failure occurred due to a failed memory allocation in the operating system. Check low memory conditions.
0x0004	Error	`Failed to map device registers.`	This failure occurred due to a failed memory allocation in the operating system. Check low memory conditions.
0x0003	Error	`Unsupported medium.`	This is an internal NDIS error. Check the operating system installation.
0x0002	Error	`The network driver initialization failed.`	This may be a firmware driver mismatch or corrupt installation. Check the firmware version, reinstall the firmware and try again. This may also indicate a hardware problem.
0x0001	Information	`The driver successfully loaded.`	This message is informational and indicates successful loading of the device driver.

Retrieving iSCSI Error Log Codes on Windows Server 2003 and 2008

For Windows Server 2003 and 2008 operating systems, the OneConnect iSCSI (be2iscsi) driver generates error codes in the system event log in the form of Event ID 11 errors. These error codes can be viewed by using the Event Viewer application.

To view the error codes:

1. Click the **Start** tab on the bottom of the screen.
2. Click **Run**.
3. Type **`eventvwr`** and click **OK**.
4. Click **Windows Log**.
5. Click **System**.
6. Click the be2iscsi error under System Events to show the details of the event.

The be2iscsi driver logs errors with the port driver error code of SP_INTERNAL_ADAPTER_ERROR, which translates to an Event ID 11 entry in the system event log.

The following is an example of the be2iscsi driver error code 0x11800003 viewed with the Event Viewer application. The screen displays the driver generated error code in the fifth DWORD (offset 0x10) of the word dump.

Note: To improve the visibility of the error code in the Data field of the Event Properties screen, select the Words option.

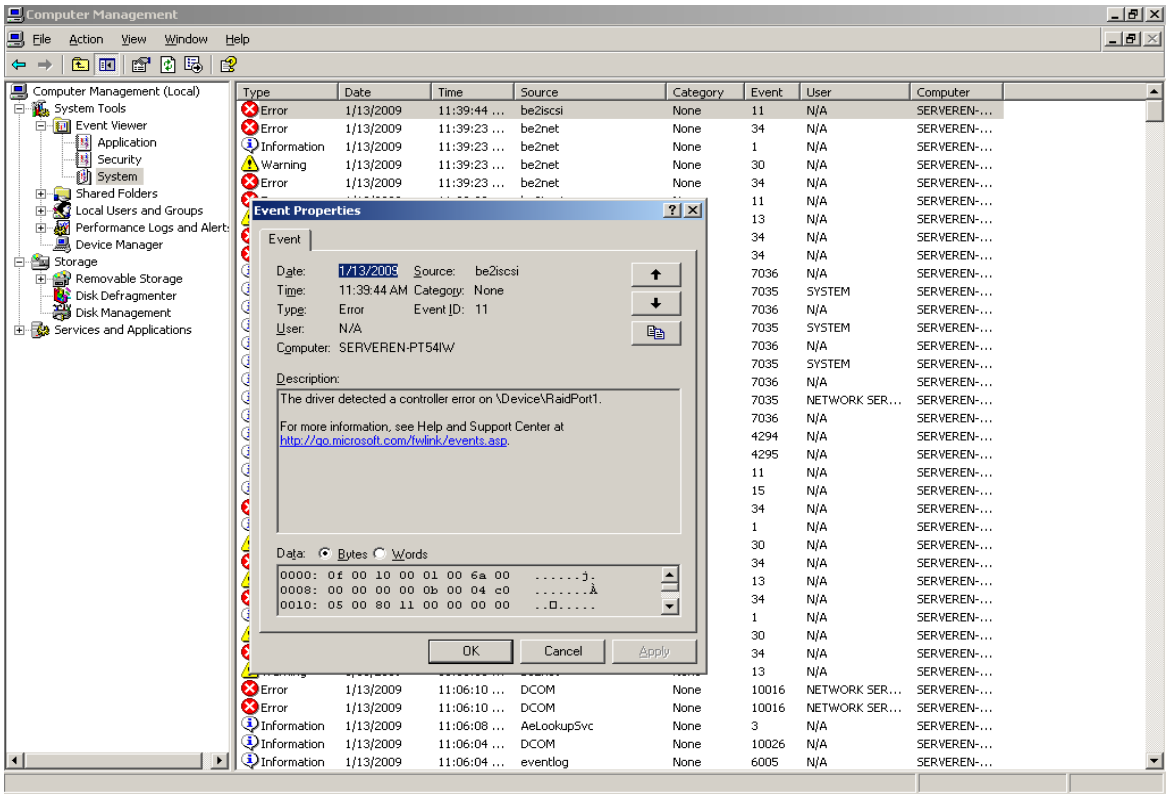

Figure 6: Windows Server 2003 be2iscsi Error

Since the OneConnect UCNAs are dual PCI-function adapters, the `\Device\RaidPort<n>` value will change depending on the device that observed the error.

iSCSI Event Log Entries

The following is a brief description of the error log codes generated by the OneConnect iSCSI Windows Server driver. It includes the error code, the message displayed, and the meaning of the message and the recommended resolution.

Table 26: iSCSI Event Log Entries

Message ID	Message	Recommended Resolution
0x348d0008	The be2iscsi driver failed a WMI IOCTL request from the port driver since the request was failed by the ARF firmware. This error is immediately followed by another error code entry indicating the WMI request code in error.	This failure indicates that an operation attempted from the Microsoft WMI application resulted in an error. Check the operation being attempted for any user or configuration errors.
0x348d0007	The be2iscsi driver failed a WMI IOCTL request from the port driver. This error is immediately followed by another error code entry indicating the WMI request code in error.	This failure indicates that an operation attempted from the Microsoft WMI application resulted in an error. Check the operation being attempted for any user or configuration errors.
0x33900002	The be2iscsi driver failed an I/O request because it failed to get a scatter gather list from the Storport driver.	This failure occurred due to a failed memory allocation in the operating system. Check low memory conditions.
0x31880001	The be2iscsi driver failed to load because initialization failed during a power management bootup.	This failure may be due to the firmware not being present or running currently. This failure may also indicate a hardware problem.
0x3184000c	The be2iscsi driver failed was unable to map one or more PCI Base Address Register and hence failed to load.	This failure may indicate a low memory condition or a hardware error.
0x3184000b	The be2iscsi driver ignored a configuration entry since the entry was invalid.	Check the registry configuration for any new entries added for Driver Parameters. The invalid entry needs to be removed or corrected. Refer to the driver read-me file for the correct range of values.
0x31840009	The be2iscsi driver failed to load a configuration value specified in the registry since the value was out of range. The driver will use the default value for this configuration parameter instead.	Check the registry configuration for any new entries added for Driver Parameters. The range specified for a configuration parameter is either too large or too small and needs to be corrected. Refer to the driver readme file for the correct range of values.
0x31840006	The be2iscsi driver failed to load due to memory allocation failure.	This failure occurred due to a failed memory allocation in the driver. Check low memory conditions.
0x31840005	The be2iscsi driver failed to load since it did not find the correct hardware IDs on the board.	This failure indicates the be2iscsi board has an incorrect vendor ID, device ID, subsystem vendor ID, or subsystem device ID. Contact your technical support.

Table 26: iSCSI Event Log Entries (Continued)

Message ID	Message	Recommended Resolution
0x31840001	The be2iscsi driver failed to load because initialization failed during normal bootup.	This failure may be due to the firmware not being present or running currently. This failure may also indicate a hardware problem.
0x31640004	An internal API failed in be2iscsi driver during initialization.	This failure may indicate a low memory condition.
0x14831000	There was an Unrecoverable Error detected by the be2iscsi driver. Following this error log entry, the next 3 entries will indicate the error codes.	This may be due to hardware errors or due to unhandled exceptions in the hardware or firmware.
0x138e0103	The be2iscsi driver failed an IOCTL request since the number of scatter gather elements required for the IOCTL buffer exceeded the BladeEngine's firmware limit. Following this error log entry, the next entry will indicate the IOCTL opcode and the payload length requested.	This error may indicate an incorrect configuration option for the be2iscsi driver. It may also indicate a low memory condition.
0x138d0101	The be2iscsi driver detected an error during offloading the iSCSI connection. The operation will be retried again. Following this error log entry, the next entry will indicate the session handle and the BladeEngine firmware error code.	This may indicate a target is in error or may point to transient network connectivity issues. It may also indicate a BladeEngine firmware error.
0x12990013	The be2iscsi driver did not receive an iSCSI command window update up to 25 seconds during I/O operations. Following this error log entry, the next entry will indicate the session handle where this error occurred. The be2iscsi driver will trigger a session recovery on the session and continue.	Check for any errors reported at the target. The Emulex iSCSI Initiator is only supported with certified Targets. Verify that the iSCSI Target is certified by Microsoft. Check for software updates at the target vendor's website. Check for software updates at the Emulex website. If the above fails, contact Emulex technical support.
0x127b0012	The be2iscsi driver received an invalid iSCSI Command Sequence Number update from the target. Following this error log entry, the next three entries will indicate the session handle and the iSCSI parameters - MaxCmdSN and ExpCmdSN respectively.	Check for any errors reported at the target. The Emulex iSCSI Initiator is only supported with certified Targets. Verify that the iSCSI Target is certified by Microsoft. Check for software updates at the target vendor's website. Check for software updates at the Emulex website. If the above fails, contact Emulex technical support.
0x12790006	A connection to the target was lost for a period exceeding the Extended Timeout (ETO). The error log entry immediately following this entry will indicate the session ID of the target that lost the connection. There will be event log entries from the disk subsystem indicating that the drives were lost. If any I/Os were in progress, the system may see I/O errors or failures.	Check the connection to the target or the state of the target device. If the target is made available, any sessions that existed previously will be reestablished and the devices will be available for I/O.

Table 26: iSCSI Event Log Entries (Continued)

Message ID	Message	Recommended Resolution
0x11990007	The be2iscsi driver received a Task Management Function that is not supported and rejected this request. The error log entry immediately following this entry will indicate the TMF function code that was rejected.	The operating system version is not supported.
0x11940008	The be2iscsi driver received a Task Management Function Abort request for an I/O request that is not present with the driver.	This may indicate a slow connection to the target. Check network connectivity to the target for any errors.
0x11840002	The be2iscsi driver encountered a mismatched version of the firmware running on the board. This error may be followed by more error codes 0x31840001 or 0x31880001 indicating that the be2iscsi driver failed to load.	This failure indicates that the driver version that is running on the system does not match the version of the firmware flashed on the board. Fix this by running the installer from the desired version.
0x11840001	The be2iscsi driver detected a failure in the hardware during initialization. This error may be followed by more error codes 0x31840001 or 0x31880001 indicating that the be2iscsi driver failed to load.	This failure indicates that the hardware has not been initialized or is malfunctioning. This may also indicate that the firmware is not running correctly.
0x11800005	Both Port 0 and Port 1 links were down for a period exceeding the Link Down Timeout (LDTO). If the initiator has connection to the target, there will be event log entries from the disk subsystem indicating that the drives were lost. If any I/Os were in progress, the system may see I/O errors or failures.	Check the links to the OneConnect UCNA. If the link is reestablished, any sessions that existed previously will be reestablished and the devices will be available for I/O.
0x11800003	Both Port 0 and Port 1 links are down.	Check the links to the OneConnect UCNA.

Appendix B DHCP Recommendations

Dynamic Host Configuration Protocol (DHCP) Recommendations

If you are using the DHCP server to obtain an IP address for the OneConnect UCNA, Emulex recommends that you set up a reservation. A reservation assigns a specific IP address based on the MAC address of the OneConnect UCNA. If you do not reserve an IP Address through DHCP, then you must set the lease length for the OneConnect UCNA IP address to unlimited. This prevents the IP address lease from expiring.